American Aviation

MANAGEMENT
ENGINEERING
PRODUCTION
OPERATIONS
MAINTENANCE
EQUIPMENT

NOV. 8

1954

50 cents

Boeing selects Honeywell Pressure Ratio Indicator for the B-52

This new Honeywell development features remote indication of engine pressure ratio, using the proved "force rebalance" principle. Measuring the *ratio* of engine inlet pressure to exhaust pressure with an accuracy of ±.02 units of ratio, this new indicator assures the B-52 pilot of easy, accurate take-off power checks, more economical cruise performance.

MINNEAPOLIS
Honeywell

Aeronautical Division

2600 Ridgway Road
Minneapolis 13, Minn.

AIRTRENDS Washington, D. C., Nov. 8, 1954

POLITICALLY INSPIRED FLURRY of military contract announcements immediately preceding election revealed $4.9 billion in "new" contracts. In haste to get contracts on the record the Pentagon included forthcoming orders and others which even the manufacturers haven't heard about yet.

TURBOPROP TRANSPORT SITUATION, set in rapid motion by Capital's order for British-built Viscounts, is developing into a full-fledged contest within the U. S. industry. American Airlines' request to Douglas, Lockheed and Convair for a four-engine turboprop replacement for the Convair 240's will prove a real catalyst. Strong likelihood of U. S. manufacturers turning to Britain for a proved turboprop spreads the issue to engine manufacturers as well as the airframe industry.

COMPETITION FOR THE BUSINESS AIRCRAFT market shows signs of getting a good deal more stiff. Several new multi-engine designs show signs of cutting directly across the market of Cessna's four-engine Model 620.

Participation of the large airframe companies, including Republic Aviation and North American Aviation, in this mushrooming interest is significant. Unconfirmed reports indicate Republic is ready to put $8 million into building a prototype with final decision pending analysis of recent extensive market survey.

NORTH AMERICAN AVIATION'S DESIGN has attracted considerable interest but NAA president J. H. Kindelberger, remembering the company's experience with the Navion, is proceeding with caution.

PRICING IS STILL THE MAJOR stumbling block. Question is: At what level does cost price the new design out of the otherwise promising market? Some companies will pay the $800,000 price of planes in the Convair 340 category. At $265,000 the Learstar appears to be attracting considerable interest. But the truly big market for new aircraft probably lies somewhere in between.

A GROWING NEED FOR GOVERNMENT interest in development of new commercial aircraft is seen by the Air Coordinating Committee, top-level government agency. Need arises ACC claims, because manufacturers are loathe to propose developments to improve general performance if it entails any sacrifice in cruise speed or empty weight.

THE CEDARHURST CASE, the case of the airlines versus the low flying ordinance of the Village of Cedarhurst, L. I., could prove a turning point in handling of airport noise and safety problems. If successful, Cedarhurst would ban aircraft flying over the community under 1,000 feet altitude and could bring about airport closure. Findings for Cedarhurst could seriously affect half the country's airports.

NEWS at DEADLINE

American Seeks Turboprops—A usually informed source reports that American Airlines has obtained an option on "several hundred" Rolls-Royce turboprop engines but adds he does not know whether they are Darts or RB-109's. AA president C. R. Smith refuses to confirm or deny the report.

Meanwhile, American has prodded Douglas, Convair, and Lockheed to develop a four-engine turboprop regional liner to replace its present fleet of Convair 240's. Specifications reportedly call for 60 passengers, cruising speed of 325 mph, and a range of 750 miles.

Findings in 8-Hour Flight Rule Dispute Aired

Arbitrator David L. Cole, in his interim report on the eight-hour flight-time dispute between American Airlines and the Air Line Pilots Association, suggests that the pilots should not only be compensated "in some form" for helping to bring in more revenue in less time but also that AA should receive some sort of "premium or penalty" to keep it from continuing or expanding flights over eight hours when they are no longer necessary.

Among his preliminary recommendations on the westbound AA DC-7 flights (which, he says, should be continued even though they take more than eight hours):

Pilots should receive credit in both flight time and pay for twice the hours they fly over eight scheduled hours.

Mileage pay component should be changed from the flat rate of 1.5¢ per mile to the 1¢, 2¢, 3¢ nonreverting method paid by several other carriers.

An additional pilot qualified to relieve the pilot, copilot, and flight engineer should be assigned to flights scheduled for over eight hours.

Cole noted that some suggestions may not be practicable but urged the two parties to consider them in working out an agreement by Nov. 26. If no agreement has been reached by that time, Cole said he would make his final report and recommendations.

TWA Nets $9 Million

Trans World Airlines has reported net earnings of $9,031,000 after taxes, or $2.71 per share, for domestic and international service for the first nine months of 1954. Similar 1953 earnings were $6,210,000, or $1.86 a share. TWA also reported record 3rd quarter earnings of $7,086,000 compared with $3,225,000 in 1953.

Northrop Net Income Up

Northrop Aircraft, Inc., reports a net income of $3,829,387, or $5.25 a share, on sales of $171,666,343 for its fiscal year ending on July 31. For fiscal 1953 Northrop had netted $3,360,516 or $5.23 a share on sales of $184,230,017. Backlog on July 31 was placed at $512 million, up $4 million from last year.

Progress Report on F-104

Lockheed, which has just received an $11 million contract for production of its F-104 at plant B-1 in Burbank, has now made more than 100 test flights since the prototype XF-104 started flying in February. The second prototype, an armament version, began flying early in October.

Tests on the lightweight, straight-wing, supersonic air superiority fighter (which uses a Wright J65 with afterburner) are ahead of schedule.

$4.9 Billion in Contracts

Defense Department contracts placed during the first four months of fiscal year 1955 totaled $4,913,996,000, the Pentagon has disclosed. Breakdown among the services included: Air Force, $1,500,000,000; Navy, $2,113,996,000; and Army, $1,300,000,000.

Major portion of AF aircraft and related equipment orders was placed during September with more than $1,000,000,000 worth of contracts. Most of the Navy's orders were granted in October with nearly $700,000,000 in contracts, termed the "greatest dollar volume of business for any single month since January 1953."

Recipients of largest Navy awards during October were: United Aircraft Corp., a total of $193,631,969 (Sikorsky, Pratt & Whitney, and Hamilton Standard Divisions), $164,587,184 to Grumman Aircraft Engineering Corp.; and $128,843,687 to Douglas Aircraft Co.

Major October AF contracts went to Douglas Aircraft Co., $128,000,000, and Lockheed Aircraft Corp., $7,000,000.

ICAO Considers Consol

ICAO 3rd North Atlantic Regional Air Navigation session in Montreal was due at press time to approve installation of seven new Consol long range navigation stations that would provide coverage over the entire North Atlantic area. Sites being considered: Iceland, Southern Greenland, Azores, Eastern Newfoundland, Labrador, Nantucket Is., Mass., and Atlantic City, N. J.

Viscount Accident Fatal

The first fatal accident involving a Vickers Viscount took place at Mangalore, Australia, on October 31. It involved Trans-Australia Airlines' first (of six) turboprop transports. The Viscount crashed and burned while a senior pilot was instructing two junior pilots on three-engine take-offs. All three were killed but five other occupants escaped. Three more Viscounts are due to be delivered to TAA before Christmas. Prior to the accident scheduled operations were to have started on November 15.

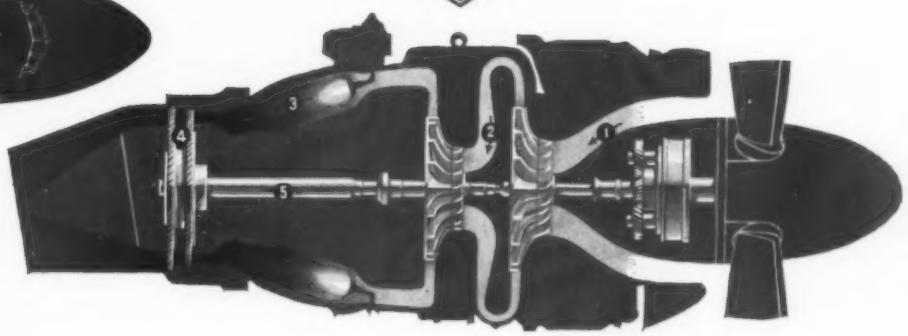
Merger for Bonanza/SWA?

Bonanza Air Lines has offered to make an outright purchase of Southwest Airways or as an alternative suggested three merger deals. In testifying at hearings in the Southwest Renewal Case, Bonanza executive v.p. G. Robert Henry said the purchase offer, at a price to be fixed by CAB, was for SWA's operating authority and all ground and flight equipment, exclusive of Martin 2-0-2 aircraft.

Capital Airlines

VISCOUNT

POWERED BY ROLLS-ROYCE



THE ROLLS-ROYCE PROPELLER-TURBINE ENGINE

OPERATING CYCLE: (1) Air is drawn into the engine through an annular air intake and (2) directed to a two-stage centrifugal compressor. (3) This compressed air is then forced to seven straight-flow combustion chambers where it is mixed with low volatile kerosene and ignited. (4) The tremendous energy created drives a two-stage axial-flow turbine. (5) The turbine power is transmitted by a shaft to drive the engine compressor and then through a high ratio reduction gear to drive the propeller.

The Magic of a Name... ROLLS-ROYCE

For forty years Rolls-Royce aero engines have written aviation history — and the four propeller-turbine (turbo-prop) engines that power the Capital Viscount* represent Rolls-Royce's latest engineering achievement.

Cruising at 335 miles an hour, the Capital Viscount will take you to your destination swiftly and in supreme comfort — almost completely free from cabin noise and vibration.

*Pronounced Vi-Count

The Capital Viscount will be serving you soon — watch for the announcement!

Capital AIRLINES

SWIFT, SMOOTH, SILENT, SURE

Letters

Letters should be addressed to The Editor, AMERICAN AVIATION Magazine, 1025 Vermont Ave., N. W., Washington 5, D. C. Anonymous letters will not be printed, but names will be withheld upon request.

Aviation Education

To the Editor:

Seven years ago in California 125 high schools and junior colleges offered complete programs in aviation, including actual orientation flights. Because of a lack of interest on the part of aircraft manufacturing, state support of its aviation education program has dwindled to the point where this year's budget carries no item specified for aviation education. We have also just sold our only plane used in the promotion and supervision of aviation education in the high schools and junior colleges and have actually gone out of business except as we can promote aviation education through conferences and correspondence.

EARL SAMS
Consultant in
Secondary Education
State of California
Department of Education

The "New" Major

To the Editor:

We have read with interest the article in AMERICAN AVIATION on September 27 relating to the Handley Page Herald. You assessed its merit as a replacement for the DC-3.

As you correctly state, the specification to which the Herald has been designed was the result of a very careful survey among the many present operators of DC-3's in all parts of the world.

You regard the fact that this new aircraft will be powered by new engines as being perhaps the biggest question mark. With this we must agree, since it is well known that commercial operators, while welcoming the profit-making potential of modern aircraft, are invariably reluctant to accept the advantages of a modern powerplant installation if any well-proven alternative is available.

Against this, in the case of the Herald, it must be stated that the Alvis Leonides Major is the only piston engine capable of providing the required performance which can be in production when required for the Herald.

The Leonides Major is, in effect, a 14-cylinder development of the 9-cylinder Leonides, and as such will have built into it automatically many features already fully developed. The initial bench-running of prototype engines has proved so satisfactory that the British Ministry of Supply felt justified in placing a substantial order for production engines for the Bristol twin-engined helicopter being developed for the Royal Navy and the Royal Air Force. Already, engines for prototype installation have been delivered for this project as well as for flight development in a Miles Marathon.

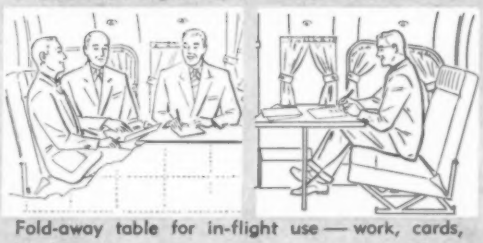
You state that the 9-cylinder Leonides has not yet reached a 500-hour overhaul period. This is not so since the 501 Series of the engine has an

flexibility in the new AERO Commander 560

Flexibility of cabin arrangement is another comfort advantage the Aero Commander 560 brings to the flying executive.

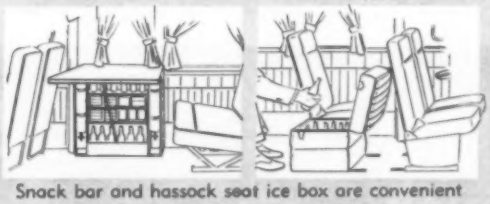
Pictured here are but a few of the optional features made possible by the long, wide cabin of this twin-engine business airplane.

Hassock seat and lowered chair back form comfortable full length couch.



Fold-away table for in-flight use — work, cards, lunch.

Individual chairs with reclining backs adjust fore and aft for added comfort — leg room.



Snack bar and hassock seat ice box are convenient for long hops.

WRITE DEPT. 129 FOR NEW CATALOGUE

AERO DESIGN Commander 560

AERO DESIGN AND ENGINEERING COMPANY • TULAKES AIRPORT, P. O. BOX 118 • BETHANY, OKLAHOMA

overhaul life of 700 hours, and the 502 Series 600 hours. The reason for the admittedly slow build-up in overhaul life has been the constant request for increased power to meet the increasing payload demands of the aircraft constructors.

Do you not agree with us that the smaller operator, with whom the majority of DC-3's are in service, is probably better equipped to maintain, and, if necessary, overhaul a "new" piston engine of the Leonides Major type than a turboprop unit, as so often suggested as the more appropriate alternative even for aircraft of the Herald pattern?

T. C. WALLACE
Sales Manager

Aero Division
Alvis Limited
Coventry, England

Faster DC-3's

To the Editor:

In *Airtrends*, Sept. 28, 1953, you stated that a study by a local service consultant showed that one mile per hour increase in air speed would cut DC-3's direct operating cost by $1000 annually.

I would like to correspond with the consultant who worked up these figures as we are producing an engine which considerably ups the speed of DC-3's and would like to project similar figures which we would make available to our customers. Therefore, it would be extremely helpful to see how the consultant in question arrived at his figures.

Thanks kindly. Keep slipping useful bits of information into your column. I don't suppose I have to point out that my inquiry shows AMERICAN AVIATION has a long "active life" after publication.

DAN THOMPSON
Advertising Manager

Steward-Davis, Inc.
Gardena, Calif.

Books

Power and Policy. *By Thomas K. Finletter; published by Harcourt, Brace and Company, New York. 408 pages. Price: $5.00.*

A deep look at U. S. military power and foreign policy in the hydrogen age is taken by Thomas K. Finletter, Air Force Secretary from 1950 to 1953, whose broad experience makes him qualified as a true expert in this field.

Finletter brings out the urgency of his topic at the outset, stating that a point will soon be reached where the supremacy in air-atomic power will shift from the U. S. to Russia "unless we become considerably more alert than we are." He estimated "for the purposes of our national policies and planning" that this would take place during 1956.

At this time, Finletter noted, the U. S. may expect Russia "to be more aggressive" in its foreign policy and to be "considerably more willing to risk a general war."

The former AF secretary urged greater air power emphasis, stating that

the USAF's budget should be increased at least $6 billion over the present amount (about 50%) to keep the Soviet Union from gaining air superiority. He called for a new military strategy for "the kind of overwhelming strategic air . . . which will make the Russians fear to make atomic war," adding that "complacency about our atomic-air is the greatest weakness in our defense planning." . . . HSB

The Greatest Airlift— *The Story of Combat Cargo, by Capt. A. G. Thompson, USAF. Printed by Dai-Nippon Printing Co., Tokyo, Japan. 464 pages, illustrated. $3.00.*

"By the time the Korean truce was signed in July 1953, combat cargo planes in the Korean airlift had carried 697,000 tons of supplies, mail and passengers including 2,650,000 passengers and 314,500 air-evacuated wounded." This is but a sample of the many vital statistics hidden in the pages of Capt. Thompson's book that document the role of air power and air logistics in Korea.

In "The Greatest Airlift," Thompson combines a detailed account of the work of combat cargo forces with a heavily pictorialized story of the men who made it possible. As public information officer and historian of the 315th Air Division almost from the day hostilities began he, better than anyone else, can tell this story. . . .JSM

The Stars at Noon *—By Jacqueline Cochran. 274 pages. Little, Brown and Co. $4.50.*

Jackie Cochran has long been a controversial figure in aviation. This autobiography gives a real insight into the character of a determined gal who rose from sawdust and poverty in the Florida swamps to a world figure in industry and flying. It is a candid, sometimes touching, and always revealing self-portrait sprinkled with anecdotes and names in aviation. Many names one might expect to find are missing.

In more than one way the book is a "must" for an aviation library, for Jackie's aviation achievements have been many. For an example of how that mysterious quality known as drive can direct a person on and upwards, the book is excellent. An especially interesting section, for the first time in the public realm, is Jackie's past experiences with mind reading or its equivalent, and how she demonstrated thought transmission with regard to airplane accidents. One can't help but admire her courage in bringing out such a frankly introspective book.

They come from thousands of miles for Reading's unsurpassed service!

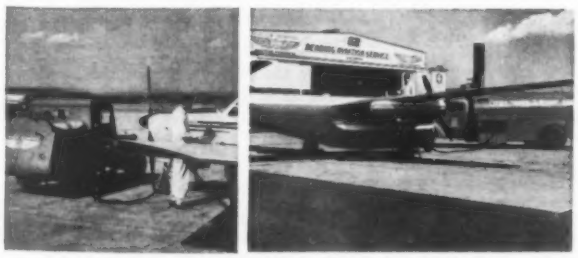
New prop shop is CAA Approved for servicing of Hamilton Standard and Hartzell propellers. In foreground is Supervisor Ed Heine who puts 16 years' prop experience into every job.

Reading Aviation Service Attracts Industrial, Executive, And Private Aircraft From All Over The Country For The Finest Servicing Available Today.

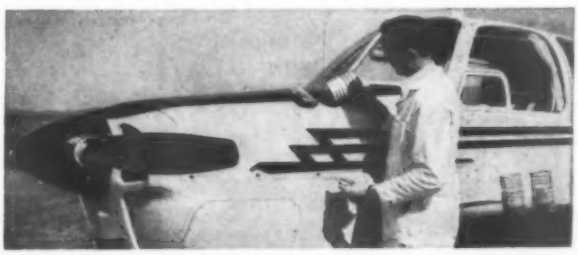
It is no accident that aircraft come from thousands of miles to benefit from the thorough one-stop servicing of Reading Aviation Service at Municipal Airport, Reading, Pa. Nor is it any accident that RAS uses Cities Service Aviation Products. Says President A. M. Bertolet: "A great deal of credit for our excellent reputation can be attributed to use of only the finest materials . . . materials such as Cities Service Aviation Products."

Sales and Service of DME Equipment is newest function of complete radio and electronics center. RAS is one of the very few companies in the U.S. chosen to sell and service both Narco and Bendix distance measuring equipment.

Most major inspections completed in a day. Here in the main hangar, a staff of 70 RAS specialists insure fastest, most dependable service. In foreground is twin-engine de Havilland for which RAS is sales agent.



2 Ways to gas-up with Cities Service Gasolene . . . Jeep-truck for small aircraft, large tank-truck for bigger planes. "Cities Service Gasolene gives best performance," says RAS.



Filling Up with Koolmotor Aero Oil . . . RAS uses only new Koolmotor because, says Pres. Bertolet: "We've found it reduces oil consumption, valve guide wear and gives better engine protection."

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REGIONAL OFFICES

New York City: Administration Building, LaGuardia Airport, Station 71, New York, N. Y. Stephen R. Kent, director of advertising; Menard Doswell III, regional advertising manager. Joan Gay Payne, sales promotion manager. Phone: Illinois 7-4100.

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American Aviation World-Wide Directory: Twice-yearly listing of products, people, and organizations. $7.50 each. Managing Editor—Marion E. Grambow.

Official Airline Guide: Monthly publication of airline schedules and fares. $13.50 per year in USA; $14.00 in Canada; $15.00 elsewhere. Published from 139 N. Clark St., Chicago 2, Ill. Phone: Central 6-5804. Managing Editor—Robert Parrish.

Air Traffic News (Incorporating Air Traffic Digest): Daily rates and tariff news. $175 per year. Managing Editor—Wallace I. Longstreth.

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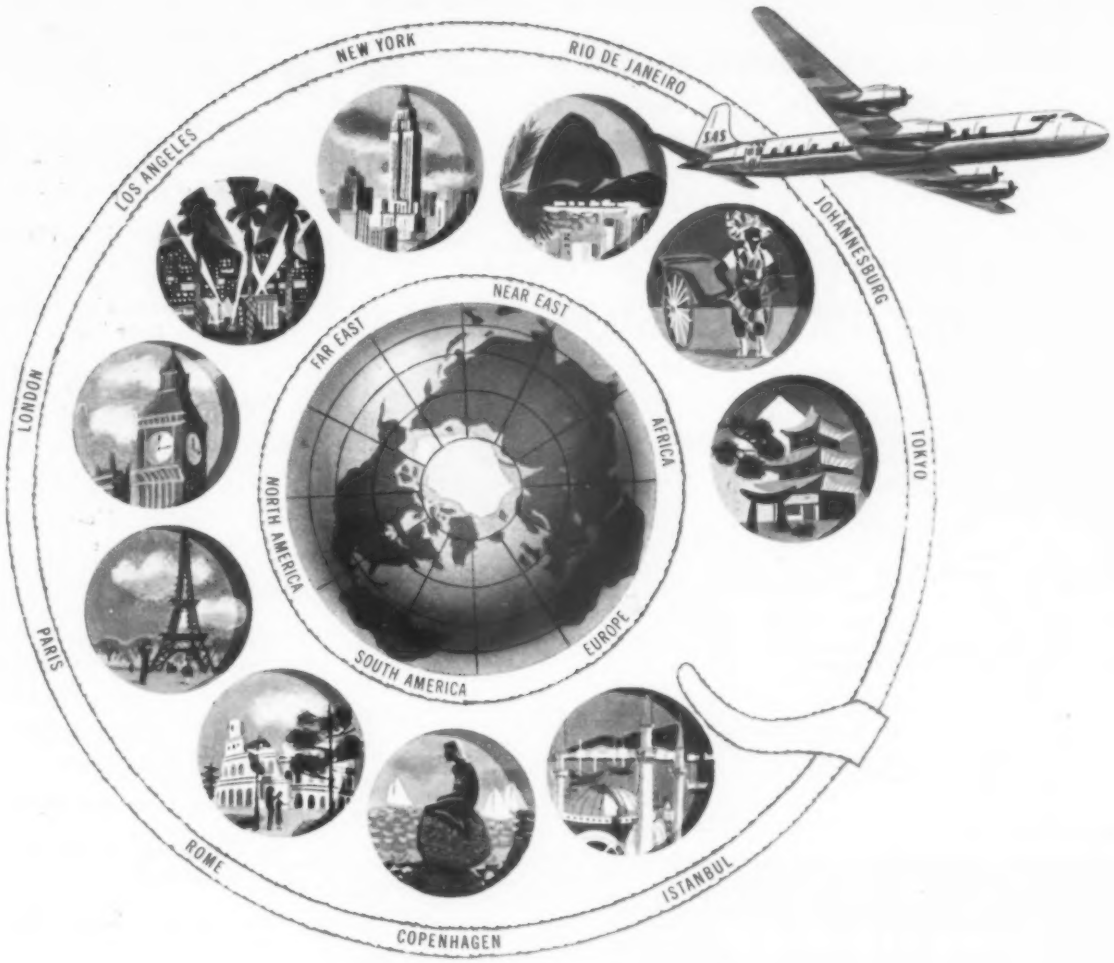

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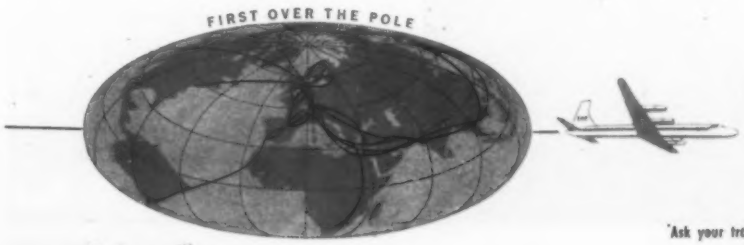

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Nov. 8, 1954 - Vol. 18 No. 12

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. . . yet at better accuracy and comparable price

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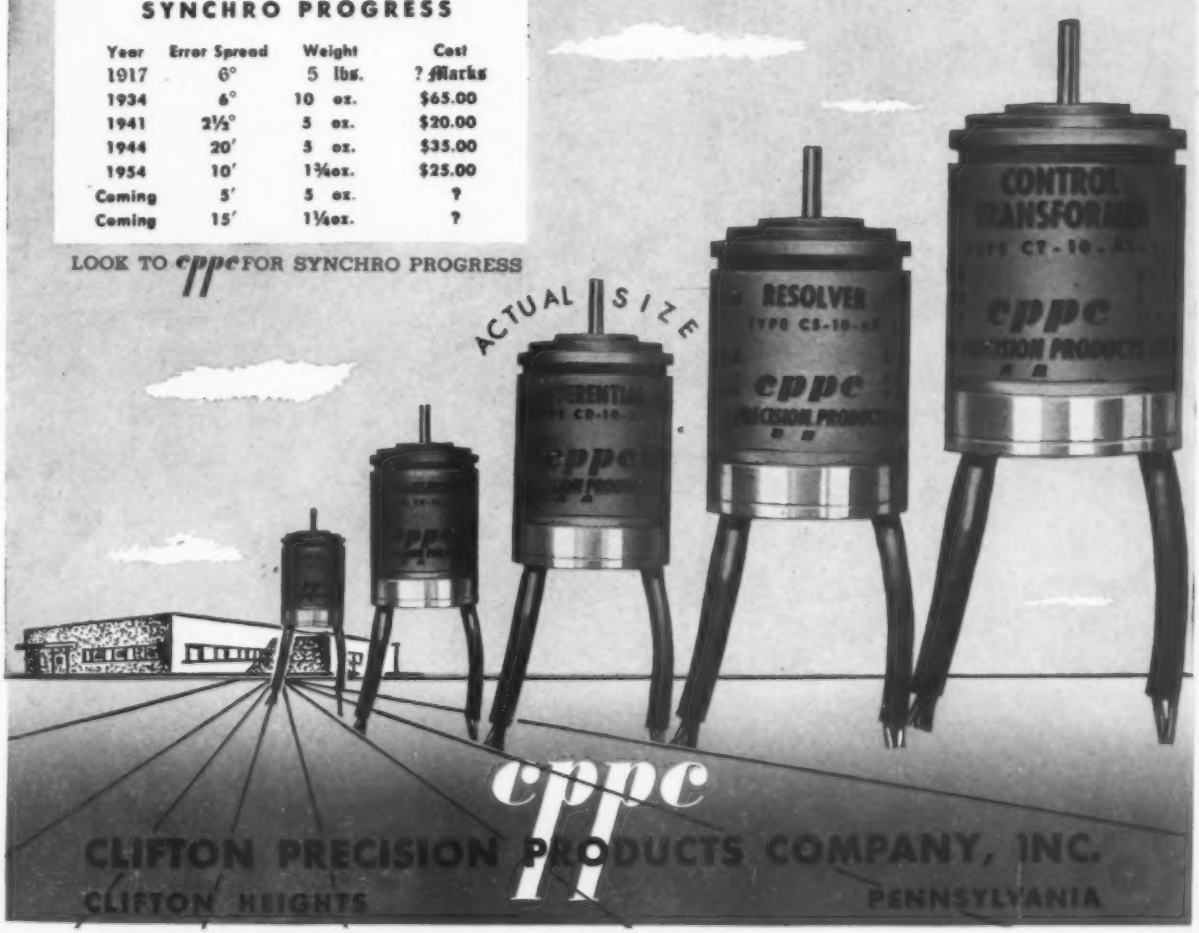
Year	Error Spread	Weight	Cost
1917	6°	5 lbs.	? Marks
1934	6°	10 oz.	$65.00
1941	2½°	5 oz.	$20.00
1944	20′	3 oz.	$35.00
1954	10′	1¾oz.	$25.00
Coming	5′	5 oz.	?
Coming	15′	1¼oz.	?

LOOK TO cppc FOR SYNCHRO PROGRESS



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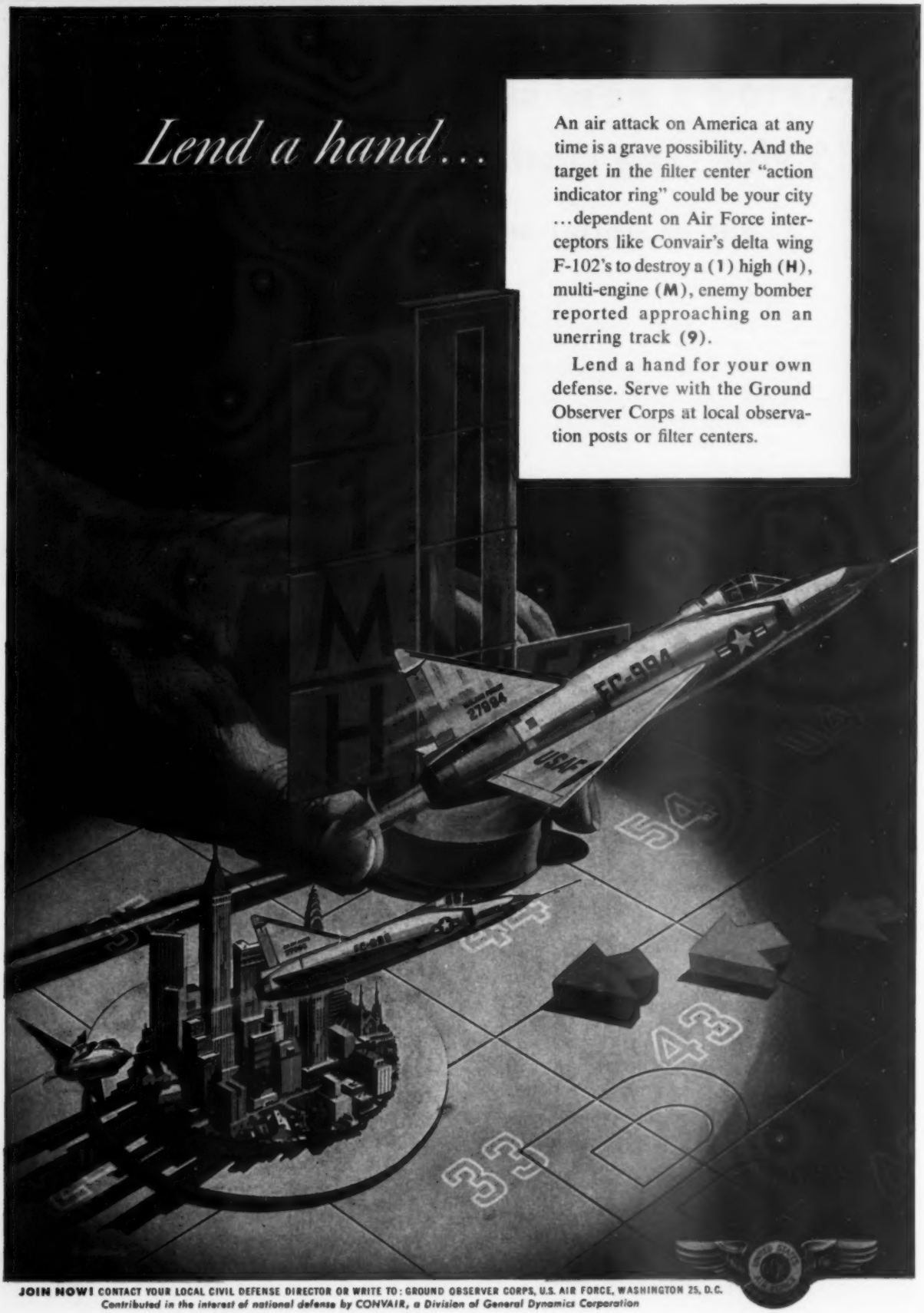
CLIFTON HEIGHTS PENNSYLVANIA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An air attack on America at any time is a grave possibility. And the target in the filter center "action indicator ring" could be your city ...dependent on Air Force interceptors like Convair's delta wing F-102's to destroy a (1) high (H), multi-engine (M), enemy bomber reported approaching on an unerring track (9).
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Personal View

By WAYNE W. PARRISH

The Rails Begin Blasting

THE RAILROADS have massed their potent propaganda guns with the objective of blasting the experimental carriage of first class letter mail by the airlines. The long-expected attack is here now, and the airlines and the Post Office Department have a fight on their hands.

Railroad propaganda appearing in railroad publications and in grass-root efforts reveals amazing distortions of fact, all tending to obscure the basic issues and to ignore the fundamental tenet that *in the public interest alone* the Post Office Department is obligated to dispatch the public's mail by the fastest means available.

It isn't the airline industry per se that is taking mail off of slow trains. It is the evolution of transportation combined with public demand for better service, the same evolution which occurred when the railroads put the pony express and stage coach out of business a century ago.

It is somewhat of a mystery why the railroads are making such a sticky issue out of the airlines taking over 3¢ letter mail when they lost $705,000,000 last year on passenger trains (which carry the mail) and when they retain the vast bulk of the postal business (second, third, and fourth class mail). The first class letter mail diverted from rail to air has been minuscule and if all of it is turned over to air (except where train service is faster), the total is still insignificant compared to other classes of mail.

The railroads would have the public believe that it can carry letter mail cheaper, but the facts are otherwise. The rails are getting 33.26¢ per ton-mile for this class of mail while the airlines are getting between 18¢ and 20¢, thus giving the Post Office Department a genuine profit probably for the first time.

Another railroad canard is the claim that the Post Office Department is putting letter mail on the airlines illegally. The Solicitor General of the Department has determined quite fully that the Postmaster General has ample power to make such a move. The Comptroller General supported this view.

The airlines can expect to be faced with considerable misinformation in the public prints. Recently Donald I. Rogers, business and financial editor of The New York *Herald Tribune*, wrote a bleeding-heart piece based wholly on railroad-furnished misinformation and ended his article with: "It seems unwise to uproot the system." Just *what* system, one might ask? Is the public to be deprived of the most expeditious handling of mail just because the rails have had a monopoly for a century?

No one doubts that the railroads are faced with some overwhelmingly tough economic problems. No one doubts, either, that the nation needs the railroads. But many of their problems of today are of their own making, arising from their failure to plan ahead and to make adjustments in equipment programing in the light of changed conditions, in the interest of the public and the nation. It is unfortunate that the railroads in their slap-happy effort to find alibis for their mistakes or excuses for natural transportation evolution, have determined to aim their guns at the airlines. In the long run they can't stop progress or public demand; they would do much better to get their own houses adjusted to today's and tomorrow's world.

Let the Bullets Zing

WE CAN'T think of many things more emotionally controversial in this country than the airport fight between Dallas and Fort Worth. Or sillier.

It's high time to bring the feuding to a stop for the simple and practical reason that the cost to the airlines of serving two airports instead of one for the two cities amounts to somewhere between $2 and $3 million a year and will cost much more as time goes on. Such cost will inevitably be translated into higher fares.

Dallas' pride is understandable but pride should not come before common sense and cost. At the risk of getting riddled with Texas bullets and sprayed with outbursts of foolish oratory, we would like to recommend that Fort Worth (which initially bent over backwards to solve the two-city problem) have the goodness of heart to offer to erase the name of Amon Carter as the name of its field and re-name it North Texas International Airport, if Dallas will have the common sense to accept a share of what is one of the finest and best-planned airports in America.

Grown-up men, especially professional Texans, seem inclined to pass on a costly heritage to their heirs because of something they choose to call civic pride. One terminal for Dallas and Fort Worth is the only possible sound solution and we think it's about time Dallas rose manfully to the occasion and conceded it. At that point civic pride will have a real meaning.

Overhaul Slumps

ALTHOUGH the economic health of most of the aviation industry ranges from good to excellent, the private overhaul and maintenance firms are currently operating at about 30% of capacity. Despite statements by the Air Force that it would contract out to private firms a substantial volume of overhaul business, the evidence so far indicates that it is retaining the bulk of such work for its own depots and awarding the bulk of the surplus workload to prime manufacturers. Thus the private overhaul firms who were urged only a couple of years ago to provide facilities are now getting an ever smaller amount of business. Some statement of firm policy needs to be made by the Air Force.

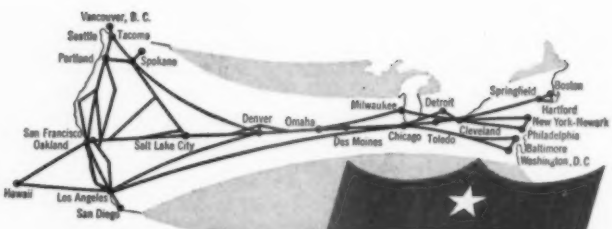
Time away is your biggest travel cost

This is your best way to reduce it

If you charged salary hours to "time away from the office"... and added the value of "work not done because key man is away"... you'd really see how expensive and wasteful slow surface travel is! When hours are dollars, United Air Lines can trim whole days from business trips, move salesmen faster, speed your personnel to profit opportunities. Mainliner® travel saves time *and* money. Ask about the volume Air Travel Plan.

The Money Belt of the U.S.A. ➡

For example, over $58 billions in retail sales are made annually in just the metropolitan areas and counties served by United. "Fly-drive" service makes even more territory easy to reach.



UNITED AIR LINES

The Business Route of the Nation

For reservations, call or write United Air Lines or an Authorized Travel Agent

When & Where

Nov. 8-9—National Air Taxi Conference, annual mtg., Biltmore Terrace Hotel, Miami Beach, Fla.

Nov. 8-10—National Aviation Trades Assn. annual convention, Biltmore Terrace Hotel, Miami Beach, Fla.

Nov. 8-13—Air Line Pilots Association convention, Sheraton Hotel, Chicago.

Nov. 10-12—Industrial Management Society, 18th national time and motion study and management clinic, Hotel Sherman, Chicago.

Nov. 11-12—Air Mail Pioneers, Western Div., annual reunion, Hollywood Roosevelt Hotel, Los Angeles.

Nov. 12-13—National Symposium on Quality Control and Reliability in Electronics, Statler Hotel, New York City.

Nov. 14-17—Aviation Distributors and Manufacturers Assn., 12th annual mtg., Mayflower Hotel, Washington, D. C.

Nov. 15-16—Air Traffic Conference mtg., Waldorf Astoria, New York City.

Nov. 15-17—Magnesium Association 10th annual mtg., Hotel Chase, St. Louis.

Nov. 17-19—California Assn. of Airport Executives semi-annual mtg., Claire Hotel, San Jose, Calif.

Nov. 18-19—American Society for Quality Control, ninth Midwest Conference, Baker Hotel, Dallas, Tex.

Nov. 18-19—Airport Operators Council, mid-year board of directors mtg., Park Plaza Hotel, St. Louis.

Nov. 29-Dec. 3—American Society of Mechanical Engineers annual mtg., New York City.

Nov. 30-Dec. 3—American Rocket Society, ninth annual mtg., Hotel McAlpin, New York City.

Dec. 17—Eighteenth Wright Bros. Lecture, U. S. Chamber of Commerce Building Auditorium, Washington, D. C.

Dec. 20—Eighteenth Wright Brothers Lecture, Los Angeles.

Dec. 22—Eighteenth Wright Brothers Lecture, Cleveland.

Jan. 24-28—Twenty-third annual mtg. of the Institute of the Aeronautical Sciences, Hotel Sheraton-Astor, New York City (including Honors Night Dinner).

Mar. 11—Institute of the Aeronautical Sciences national flight propulsion mtg. (restricted), Hotel Carter, Cleveland.

Mar. 28-Apr. 1—Ninth Western Metal Exposition, Pan-Pacific Auditorium, Los Angeles.

June 21-24—Joint mtg. of the Institute of the Aeronautical Sciences and the Royal Aeronautical Society of Great Britain, IAS Building, Los Angeles.

International

Nov. 8-10—Air Industries and Transport Assn. of Canada, annual mtg., Chateau Frontenac, Quebec City.

Nov. 10-13—International Air Transport Association helicopter committee mtg., Montreal.

Apr. 5—International Air Transport Association technical conference, San Juan, P. R.

Industry Spotlight

• New official helicopter record was set by the Army's Sikorsky XH-39 at Bridgeport, Conn. New record is 24,500 feet, replacing the previous Piasecki H-21 record (Sept. 1953) of 22,110 feet. This is the same helicopter which holds the world helicopter speed record of 156 mph.

• Interest is running high in the Pan American World Airways Hi-Per DC-3, a version of the Douglas transport powered by Pratt & Whitney R-2000 engines. Plane has recently been demonstrated to Avianca in Bogota, Colombia, and to Piedmont Airlines. USAF is also interested and may convert C-47's used in the Arctic to this configuration which ups gross weight from 25,200 pounds to 26,900 and increases payload by 1528 pounds. Cruise speed is 214 mph at 10,000 feet altitude.

• Grumman's F9F-4 Panther equipped with the company's "super circulation system," a form of boundary layer control, is proving very successful. In addition to improving take-off and landing characteristics of the F9F-4, the system increases carrying capacity of the plane by 2400 pounds while adding only 75 pounds weight. Developed by BuAer's John S. Attinello, the system uses bleed air from the engine which it ejects through narrow slots over the trailing edge flaps.

• Aeroproducts' propellers on Fairchild C-119's have logged over 115,000 hours multi-engine operation with considerable success. More than 100 are in use. Program is underway to raise time between regular removals for inspection from 500 to 750 hours and between propeller overhauls to 1000 hours.

• Titanium, "the wonder metal," continues to be a problem metal as well. Douglas's Dr. Lee Schapiro told AIA's National Aircraft Standards Committee recently that the cost per pound of weight saved by substitution of titanium for steel amounts to $400, although this may improve. General Electric finds the weight advantage achieved to be small in proportion to the risk and cost. Chance Vought, by comparison, reported saving about 120 pounds per plane by use of some 20,000 titanium fasteners on the new F8U day fighters.

• Bell Aircraft Corp.'s new Model 47G helicopter, powered by a 250-hp Lycoming engine, has logged more than 300-hours operation. The Lycoming 0-43V1 engine replaces the 200-hp Franklin engine used in earlier models. Basic dimension of the 47G-1 is the same as the 47G, but cabin provides for four passengers.

• de Havilland-Canada will probably get into the engine building field if the Canadian government gives the green light to a proposal for Canadair to build the North American F-100 with the DH Gyron engine as the powerplant.

• Bell Aircraft Corp., which recently delivered its first titanium engine pod for Boeing's B-47, estimates that 20% of its power packs will be made of titanium in the future.

• United Air Lines, which has completed installation of Eclipse Pioneer autopilot couplers on its 64 Douglas DC-6's, is installing the Sperry Gyroscope couplers on its DC-7 fleet. Sperry's couplers are also used on UAL's DC-4's.

• Jacobs Aircraft Engine Co. is seriously considering license production of one or more low-power turbine engines of foreign design and possibly of some foreign accessories. Under consideration is the Napier Oryx gas turbine.

• Although official word on the dimensions of the Convair XFY-1 is still unavailable, General Electric's useful "Aircraft Data Chart" lists its length as 30′ 9″ and its wingspan as 25′ 8″. Although it also provides general data on the Lockheed XFV-1, equivalent to the Convair "Pogo Stick," it does not list dimensions.

• New metal-forming process developed by Olin Mathieson Chemical Corp. of New York, by which complex tubing patterns are formed in aluminum, copper, or steel sheet, is reportedly being considered by two aircraft manufacturers for cooling aerodynamic surfaces of supersonic aircraft. A desired tube pattern is first applied to two sheets of metal using a special stop-weld chemical. Sheets are roll-bonded into one under temperature and then the treated areas are "inflated" under 3000 psi pressure to form integral tubing.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

We're for never blowing bubbles

THE BUBBLE TYPE CANOPY on the new Martin B-57B light bomber had to be safely pressurized at altitudes of 8 miles and higher. Ordinary inflatable seals between the bubble and cockpit might blow out from the effect of high pressure inside the canopy and low pressure on the outside.

B. F. Goodrich engineers had a ready-made answer to the problem—their inflatable strip seal. It has a U-shaped solid rubber base and a rubberized fabric diaphragm nested inside the base. When inflated, this diaphragm simply *lifts* to seal effectively. Low inflation pressure gives full expansion with very little or no stretch. Of course, less stretch means less strain. It works like blowing up a paper bag so that dangerous stretching, like blowing up a toy balloon, is eliminated.

The new inflatable strip seal works almost instantly. Even at minus 65°, it inflates with approximately the same pressure that ordinary seals needed at room temperature. There are other advantages. It fits around complex curves. It seals and unseals quickly. Sliding wear and scuffing are minimized because of high clearance when seal is deflated.

The new B. F. Goodrich seal is now in use on more than a dozen makes of planes, including latest jet fighters and bombers like the F-100 and B-57.

Other B. F. Goodrich products for aviation are tires, wheels, brakes; De-Icers; heated rubber; Pressure Sealing Zippers; Avtrim; fuel cells; Rivnuts; hose; other accessories. *The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER

ESTABLISHED JUNE 1, 1937

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American Aviation

VOL. 18, NO. 12

Studebaker-Packard Enters Aircraft Field

The consolidated company seeks to become a permanent defense contractor which can produce its own designs as well as those of other companies

BY ROBERT M. LOEBELSON

THE NEWLY FORMED Studebaker-Packard Corp., which has been in and out of the aircraft business since World War I, has decided to become a permanent defense producer.

AMERICAN AVIATION has learned that the board of directors of the Detroit and South Bend, Ind., automotive company has approved such a program.

In deciding to emulate such former non-aviation firms as General Electric Co. (jet engines at Evendale, O., and Lynn, Mass., guided missiles and electronics at Syracuse and Schenectady), General Motors (Allison jets and Aeroproducts propellers), and Westinghouse Electric Co. (jets at Philadelphia and Kansas City, electronics and missiles at Baltimore) and become a permanent part of aviation, Studebaker-Packard has:

- Entered a recent USAF competition for a 2000-lb.-thrust turbojet engine.
- Submitted a bid to the USAF to use 200,000 square feet of the main plant at Detroit to overhaul jets (possibly Allison J33's).
- Started designing (with its own money) a helicopter jet engine which would be mounted at the tips of the rotor blades.
- Begun considering guided missile designs, various types of aircraft accessories, and constant speed drives.

Talbott gives hope

The AF competition for the small turbojet is now over and Fairchild Engine Division has received a development contract. Pentagon sources report, however, that Studebaker-Packard may soon receive a similar contract, thus resulting in the parallel development of two 2000-lb.-thrust power plants. This report has been partially confirmed by Air Force Secretary Harold E. Talbott, who recently told Studebaker workers at South Bend that, "I sincerely hope the Air Force will be able to use the facilities of the Studebaker-Packard Corp. to maintain the finest AF in the world."

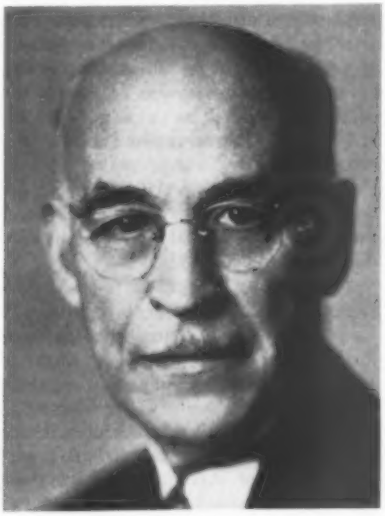
Obviously the new consolidated company, whose two members reported a six month net loss of $10 million prior to the official merger on October 1, cannot hope to enter the aircraft field using only its own funds. The Navy and Air Force will have to furnish the contracts to pay for Packard's design experience. But there are indications that both services are now ready to welcome another firm into the select circle of major aircraft engine companies.

Aircraft engines galore

Studebaker-Packard is far from being a novice in the aircraft engine field:

- During World War I, Packard produced about 6500 Liberty engines, more than any other manufacturer. Most of the credit for the development of the Liberty is given to Col. Jesse G. Vincent, now 74. Colonel Vincent, who retired in 1950 as vice president-engineering, is now an engineering consultant to Packard.
- Between World Wars I and II—a period in which the nation's expenditures for the development of new aircraft engines were at a very low level—Packard received the largest engine contract from the military. The contract involved an order for 150 powerplants.
- In 1931 the Detroit company was voted the Collier Trophy "for development of a diesel engine for aircraft."
- During World War II, Colonel Vincent (who directed the construction of an experimental station at McCook Field in Dayton in 1918 and later headed the airplane engineering department there) was asked by the British to build the Rolls-Royce Merlin aircraft engine. As a result, Packard turned out 55,523 V-1650's for use in such planes as the North American P-51 Mustang and the Vickers Supermarine Spitfire. Peak rate was 75 of the V-1650's a day, and the price dropped from $400,000 apiece for the first 10 to $10,000 each in quantity production. In making the Merlin producible as the V-1650, power

President Nance



Vice President Brodie

They, and the military services, are thinking alike.

was increased by 120% to 2200 hp.

• After V-J Day, Packard stayed in the aircraft engine field, working on the development of a ducted-fan (the J43 by-pass turbojet) at a Toledo plant. But when the USAF's budget money was cut sharply in 1947 and 1948, the J43 was terminated and Packard left the aircraft business.

• Re-entry came in 1951 when Pentagon planners decided the General Electric J47, used in the North American F-86 Sabre and the Boeing B-47 bomber, would be needed most in the Korean War and any expansion of the fighting. Defense Mobilizer Charles E. Wilson (the former G-E president, not the present Defense Secretary) ordered two additional sources for the 6000-lb.-thrust J47. Packard and Studebaker were selected and the AF consequently invested about $100 million at each plant for machine tools and facilities.

Studebaker phased out the J47 in January but Packard is still trickling out a few of the engines each month in accordance with Pentagon mobilization base-broadening policies. Another new gas turbine activity involves a contract awarded by the Navy Bureau of Ships in June to have Packard develop a 10,000 shaft horsepower engine.

Engineering know-how

The Detroit company, known for its engineering know-how for many years in both the automotive and aircraft fields, has told both the Navy and the Air Force that it wants to serve the defense effort on a permanent basis. And the two services, in turn, have informed Studebaker-Packard president James J. Nance that they want Packard and the South Bend division as permanent prime defense contractors, capable of producing not only other companies' products but also their own designs.

The company's defense operations are headed by Vice President George H. Brodie. Brodie is well known in the aviation industry as a result of his activities as liaison man between the Army Aviation branch and Packard's Liberty engine project in 1918 and his work on the V-1650 and as manager of the marine (PT boat) engine division during World War II.

In charge of Packard's Aircraft Division as chief engineer is Oliver E. Rodgers, 38, who joined the company in the spring of 1953. Rodgers formerly served as assistant manager of engineering at Westinghouse's Aviation Gas Turbine Division in Philadelphia. He is a member of the National Advisory Committee for Aeronautics.

Packard now has between 100 and 125 engineers doing research and development on gas turbine engines for both ships and aircraft and is busily recruiting more. A recent help-wanted advertisement, for example, indicated that the auto company is seeking engineers with a minimum of five years experience in thermodynamics, compressor and turbine design, stress analysis, or heat transfer.

Naturally, if the military contracts for research and development work on turbojets come in from the Navy and Air Force as they are expected to, Packard will step up its hiring of engineers. And as the R&D contracts evolve into production orders, many automobile workers at Detroit and South Bend will find themselves working on turbojet engines, thus helping to alleviate the periodic automotive slumps.

Capacity: 300 jets

At present, Packard's new Utica plant has about 500,000 of its 4 million square feet of floor space set aside for defense operations and has a capacity for 300 jet engines a month.

Parts for the J47 engines are machined at the main plant in Detroit (which is being vacated in favor of new "automated" facilities in the Detroit area as far as automobile production is concerned) and then shipped to Utica for assembly, testing, and shipment to airframe producers. This policy will make more floor space available for defense work at the main plant. • • •

New McDonnell Fighter

McDonnell Aircraft Corp. will produce an advanced all-weather Navy attack fighter under a new $38.7 million Bureau of Aeronautics contract.

The new plane, which marks the St. Louis firm's first entry into the attack field, will be "completely different" from current models (including the F3H Demon and the F-101 Voodoo), officials said.

Support Small Business, AF Contractors Urged

Roger Lewis, Assistant Air Force Secretary (Materiel), has given great emphasis recently to the support of small businesses in the AF's overall procurement program, urging prime contractors to maintain an adequate structure of subcontractors and suppliers.

Addressing the Eastern Seaboard Prime Contractors Conference at New York on October 20, Lewis said that each prime contractor must have an adequate supporting structure of "feeder" plants, adding "it would be extremely short-sighted of any prime contractor to fail to set up and maintain such a support structure."

In another speech the following day before the National Security Industrial Association, meeting at Wright-Patterson AFB, Dayton, O., Lewis criticized a tendency of some prime manufacturers "to desire to engineer and to manufacture all parts of the airplane." He attributed this to a "misunderstanding of the Air Force weapon systems concept" and also to the "looser type of cost-plus-fixed-fee or redeterminable type contracting."

"It is our intention to make it clear that we consider such practices to weaken rather than strengthen our industrial structure and are contrary to our procurement policy," Lewis told the Dayton group.

Lewis' comments along this line are in answer to growing concern about recent cutbacks among subcontractors in the small business category.

During fiscal year 1954, small business received 9.8% of the AF procurement dollar, but within recent months the pace has reduced.

First Flight for the T-37

Just after this photo was taken October 12 Cessna chief jet test pilot Bob Hagan took the intermediate trainer on its first flight from Wichita's New Municipal Airport. He reported excellent performance. Powered by two Continental J69's, it is an "over 350-mph" aircraft.

Subsidies Not Needed, Says AA's Smith

The total trunk airlines service in the U. S. can be operated with profit, without mail subsidy, and without delay, if the government would remove its guarantee of solvency for individual corporate carriers. This was the view expressed October 27 by American Airlines president C. R. Smith at the ninth annual convention of the National Defense Transportation Association in Pittsburgh, Pa.

Smith directed his criticism at the CAB for interpreting so-called "need" provisions of the Civil Aeronautics Act as requiring such a guarantee, through federal subsidies, to individual lines. Four trunks now on subsidy are Braniff, Colonial, Continental, and Northeast.

The AA head, claiming a "logical" merging of systems would permit the subsidy-free operation, said CAB's interpretation "removes the usual economic justification for merger." He said the overall test should be national defense and public interest benefits of the service.

He suggested the following outline:

1. The domestic trunk airline system can be self-supporting if the total of the routes and services are merged on a logical basis.

2. Necessary mergers will not come about if the "need" section of the Act is to be interpreted as a guarantee of the continued existence and solvency of individual corporations.

3. Either the "need" section of the Act should be interpreted and administered in keeping with the evident intention of Congress, or else the "need" section of the Act should be amended by Congress so as to be inapplicable to domestic trunk airlines.

In the areas of local service and overseas, however, Smith saw a continued need for subsidies.

Airline Fatality Rate Lowest on Record

Turbulence was the major cause of domestic airline accidents during the last two years, accounting for almost one-seventh of them (10 out of 67) according to a summary of 1952 and 1953 issued by the Civil Aeronautics Board. Turbulence accounted for approximately the same percentage of international carrier accidents during the period (two out of 15).

Final safety figures for 1953 reveal the lowest domestic-international fatality record to date: 0.5 per 100 million passenger-miles.

Taylor's Fiberglas Plane in First Flight

A new Taylorcraft Inc. lightplane with fuselage, wings, and other components made of plastic and Fiberglas has made its first flight at Conway, Pa., the firm's headquarters. The 1300-lb., four-place, plane has its speed increased by approximately 12 miles per hour because of the Fiberglas-and-plastic skin. Gas tanks moulded of the material hold five gallons more than metal models.

Light weight, corrosion resistance, and ease of maintenance are cited as advantages of the material. With a 145 horsepower engine the plane will sell for about $6000; with a 225 hp engine, it will be in the $9000 bracket.

8-Hour Rule Case— Back to ALPA and AA

David L. Cole, the referee trying to settle the eight-hour-rule dispute which resulted in a 25-day strike by members of the Air Line Pilots Association against American Airlines in August, has submitted his preliminary report but the case is, in effect, back to ALPA and AA for negotiation.

Cole recommends continuation of DC-7 non-stop coast-to-coast flights "subject to conditions and restrictions to be worked out by the parties."

THE TWO EYES peering at you from each side of the nose of this Northrop F-89 Scorpion may become bloodshot when used. They're T-110 rocket launchers being evaluated in this USAF flying test bed.

IAM and Airlines Resume Talks

Representatives of six airlines and 20,000 AFL-Machinists resumed discussions on a new contract in the offices of the National Mediation Board after IAM president Al J. Hayes notified the carriers of a strike "on or after November 19."

The union submitted its proposals, including a 5% wage increase and single uniform classification rates, last May 26. But National, Eastern, Capital, TWA, Northwest, and United recommended other changes which they said should be disposed of first. The IAM negotiating committee rejected the company proposals, claiming they would destroy union contracts if accepted even in part.

If the new airline-IAM talks fail, the White House may set up an emergency fact-finding board. This would postpone any possible walkout for at least 60 days after the board is created.

IMATA Absorbs TAG

A merger of activities of the Transport Air Group into the Independent Military Air Transport Association took place on November 1. TAG, which was a promotion organization for cargo air carriers, dissolved following the resignation in October of L. R. "Mike" Hackney.

Members of TAG were also members the larger IMATA which will continue under the presidency of Ramsey D. Potts, Jr.

HIGHER AND HIGHER go the helicopters. Here's the new Sikorsky XH-39 in which Warrant Officer Billy Weston of the Army set a world altitude record at Bridgeport, Conn. He rose to 24,500 feet.

NEW MONOCOUPE METEOR, in this first photo, displays tip tanks that carry all fuel. Power is a pair of 150-hp Lycomings with full-feathering Hartzell props. Acceleration from 0 to 60 mph in five seconds is claimed and ship can be airborne in 300 feet. Price for the four-place, all-metal plane is $25,000.

Slick and Tigers Go Their Separate Ways

After an unsuccessful merger effort, the Flying Tiger Line and Slick Airways have decided to operate independently in the air freight field. The carriers have also called off their "package" agreement which would have seen FTL quit the freight field to become a leasing firm, renting equipment to Slick among others.

The latest decision came after a "shallow" CAB approval of their package agreement to which the Board attached what the companies considered an impossible labor condition.

The two lines agreed initially to merge in the spring of 1953. In January of this year CAB approved the merger. The lines then started to consolidate offices, forces, etc., preliminary to final consumation of the deal which hinged on working out necessary labor provisions.

But the labor provisions were never worked out. Employee protective provisions attached by CAB to its approval of the merger, according to the companies, exposed management to claims ranging from $3-$6 million dollars.

CAB in August turned down a request to relax the protective conditions and the carriers buried their merger and came up with the package agreement. CAB late last month "approved" that agreement but conditioned it on the Tigers reaching an agreement in 10 days with its employees who would be adversely affected by the carrier's changing from an air carrier to a leasing firm.

The Tigers' management saw no possibility of reaching such an agreement and on October 26 came to the decision that Flying Tigers would continue as an air carrier.

Both Slick and Tigers have operated since 1949 under temporary all-cargo certificates which expired in August this year. However, operations continue under the certificates pending CAB action on renewal applications that have been filed by both lines.

Slick, meanwhile, is still expected to undergo a management reorganization with former top government official Delos W. Rentzel expected to figure prominently. At presstime, however, the carrier had issued no formal notice of its plans.

Airport Aid Necessary

Airport aid on at least the present scale is an unquestionable need, CAA Administrator Fred B. Lee told the New York State airport conference in Syracuse recently. Major effort in the future, said Lee, is bound to focus on expansion of facilities at existing airports, rather than construction of new ones.

Radford, Ridgway Warn Against Optimism

Warnings against undue optimism on airpower have come from two top military leaders. Admiral Arthur Radford, chairman of the Joint Chiefs of Staff, told a chamber of commerce group in Illinois, "Our national airpower is currently second to none . . . but . . . I cannot guarantee that this will always be the case. . . . We had better not grow complacent. . . . We must do more and more if we expect to retain our qualitative lead."

In Florida, Army Chief of Staff Gen. Matthew B. Ridgway told the National Guard Association that the immediate future does not look bright for large-scale Army air logistics. The Army is dependent upon the Air Force and Navy for air movement, Ridgway pointed out, and these services are encountering "many serious problems" in meeting their own needs, as well as the Army's. Cargo helicopters and convertiplanes were cited as areas of great importance, in which progress is badly needed.

News Briefs

Military

Government-owned machine tools should be controlled by the Office of Defense Mobilization rather than the military services, declares the National Machine Tool Builders' Association. The group fears that the reserve pool of machine tools might be dissipated by unwise leasing policies. . . . A new radar, with triple the range of earlier units of its type, has been revealed by the Air Research & Development Command. General Electric and Rome Air Development Center worked on it . . . **A rocket-and-parachute** combination has been developed for use as a high-altitude guided missile target by the Navy. The unit is shot to altitude, where the parachute opens, and slowly descends, looking like an aircraft on radar scopes.

Airlines

Extensive electronic training will be required by airline operations in the near future for both ground and flight crews, believes B. A. Martin, chief pilot of Lockheed-Marietta. Martin predicts high-altitude traffic under complete control from take-off to landing.

National Airlines celebrated its 20th anniversary last month. The carrier started in Florida with a 150-mile service, now flies 3000 miles of routes . . . **New York Airways** is due to extend service to Paterson, N. J., on Nov. 17. Late last month the helicopter carrier and Railway Express Agency inaugurated air express services on the east coast.

Flight Engineers International Assn.-AFL is planning to move national headquarters from New York to Washington after the first of the year. Regional HQ will remain in N. Y. . . . **New chairman** of the North Atlantic Public Relations Advisory Committee (IATA) is Gordon Gilmore, v. p. of public relations for TWA. Vice chairman is Peter Brunswick (El Al Israel). Patricia Dunn (BOAC) was reappointed secretary.

General

The Civil Aeronautics Administration has failed to develop small airports, charges the Aircraft Owners and Pilots Assn. AOPA calls for educating civic leaders on just how inexpensive small airports can be . . . The 18th Wright Brothers Lecture on Dec. 17 will be delivered in Washington by Bo Lundberg, director of the Aeronautical Research Institute of Sweden. He will repeat it later in the month in Los Angeles and Cleveland.

Metal Fatigue Caused Comet Accident

During the first few days of the Comet accident inquiry in London it was shown that the Elba accident in January resulted from disruption of the jet-liner's cabin at about 30,000 ft. There was violent decompression and the aircraft broke up in the air. Disruption of the cabin was caused by metal fatigue at points where there were local concentrations of stress (as much as 70% of the ultimate stress in the cabin is felt at certain points near the windows).

The technical investigation of the Comet accidents at the Royal Aircraft Establishment, Farnborough, showed that in the Elba accident the failure of the aircraft started at a fatigue crack near the ADF window and then ran through a crack which had been formed during manufacture. The aircraft involved in the Elba accident had flown for 3681 hours, longer than the safe fatigue life that could be given to it in the light of subsequent tests with a similar aircraft, the investigation showed.

New Supercharger Will Cut Pacific Time

Pacific-Alaska division of Pan American World Airways will reduce flight time from San Francisco to Honolulu to less than nine hours after it completes installation of new turbo superchargers in its Boeing 377's. It also estimates a saving of 800 pounds of fuel on the trip. The project is scheduled to be completed by March.

The new supercharger permits the same engine boost as before with 6 to 8 inches less back pressure. This is about 50 hp more per engine. The reduction in horsepower needed to drive the improved turbine will go to the propeller.

Cost of conversion will come to almost $450,000, but by applying the cost of normal replacements of the present units that would be made anyway, the final adjusted cost will be $303,000. PAA's Pacific-Alaska Div. estimates annual savings from decreased fuel consumption, decreased airplane time, and increased available ton-miles will amount to $393,000. Thus in nine months the conversion will pay for itself.

Last year PAA's Boeings climbed to around 19,000 feet after leaving Tokyo. They had to be held to a constant airspeed of 170 knots for six or seven hours while enough fuel was burning off to climb to 25,000 feet where jet stream velocities are higher. The new turbo superchargers will make it possible to climb initially 3000 to 4000 feet higher.

$24 Million DC-7C Order Sends SAS' Spending Over $114 Million in U. S.

Scandinavian Airlines System has placed a $24 million contract with Douglas Aircraft Co. for eight Douglas DC-7C's for delivery in the summer of 1956. The order brings the company's total dollar expenditures in the U. S. for aircraft, engines, and spare parts since 1946 to more than $114 million.

The SAS order and a breakdown of the expenditures provides an unusually clear picture of the importance of the foreign market to U. S. manufacturers. Scandinavian Airlines now has 14 Douglas DC-6B's, 12 DC-6's, 4 DC-4's, and 10 DC-3's, forming the backbone of its fleet. It also flies 6 CAAB Scandias and 2 Junkers 52's. While the basic SAS orders have been primarily Douglas/Pratt & Whitney business to date, exclusive of the many suppliers of component parts, the DC-7 order will bring Curtiss-Wright into the picture with the Turbo-Compound R3350.

This is the way the SAS dollar expenditures in the U. S., 1946 through 1953, shape up:

DC-4 purchases	$ 4,300,000
DC-6 purchases	13,100,000
DC-6B purchases	17,300,000
Total aircraft purchases	$34,700,000
Engine & airframe spare parts	$27,600,000
Operations expenses	18,000,000
Gas and oil	4,900,000
Insurance	5,000,000
Grand total	$90,200,000

Below is the airline's gross dollar income 1946 through 1953:

1946-47	$ 3,193,000
1948	3,940,000
1949	5,082,000
1950	6,231,000
1951	6,577,000
1952	8,644,000
1953	11,650,000
	$45,317,000

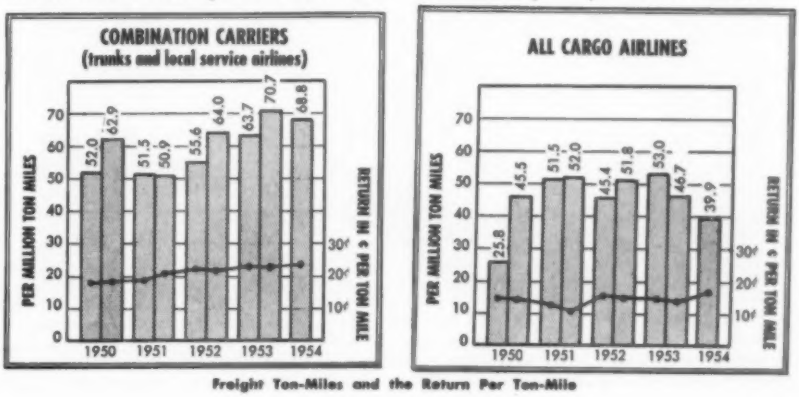
PULSE OF THE INDUSTRY

Combination Lines Do Better With Air Freight Than Cargo Lines Do

Combination airlines, those hauling both cargo and passengers on scheduled flights, get a greater average return per ton-mile from air freight than the scheduled all-cargo airlines do.

Principal reason is that the all-cargo lines operate largely between the bigger air freight generating centers where competition is keener and rates are lower. Where the shipments are smaller and the distances less great, the return per ton-mile rises sharply. For the first half of 1954, the local service airlines had an average return per ton-mile of 42.1¢ based on 562,707 ton miles, for which they were paid $237,384.

How profitable are such air freight operations—either the short-haul, little shipments or the long-haul, big shipments—is a point yet to be decided.



Freight Ton-Miles and the Return Per Ton-Mile

Seven Lines Hit New Highs in One Week

Airline finances last month seemed to be bearing out the optimism of recent financial estimates: During one week seven domestic trunks hit new stock market highs for the year (Eastern, United, TWA, National, Braniff, Western, and Colonial). In the same week the two most active airline stocks (American and Pan American) were listed among the top 20 on the New York Stock Exchange.

"There is a growing tendency among investors to recognize the inherent growth in this great industry," declared Stanley G. Welsh, a director of Douglas Aircraft Co. Welsh, who is also a partner in the New York brokerage firm of Tomes & Welsh, added "The leading companies in this field are slowly assuming investment qualities." Aircraft stocks are currently selling at just under seven times their earnings, a relatively low figure compared to other industries, Welsh pointed out.

The growing earnings of the aircraft industry, which are apparently drawing investment money, were exemplified by the nine-month net of Douglas Aircraft—over $28 million on sales of almost $700 million. During the comparable period of 1953 net earnings had been only $13.3 million on sales of $632 million. Shortly after reporting its earnings Douglas announced that it would augment its regular 62½¢ quarterly dividend with a special dividend of $1.62½. The total of $2.25 will be paid Nov. 24 to stock of record Nov. 3.

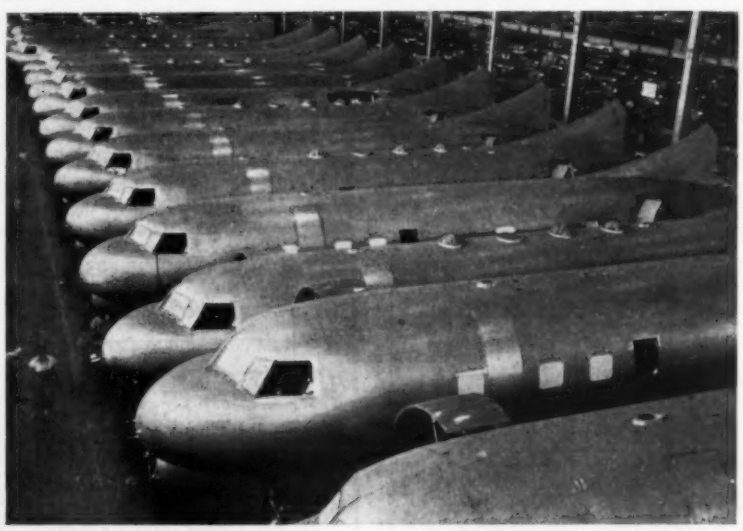
An enforcement proceeding against Northeast Airlines, the Atlas Corp., and Convair has been ended by the CAB in an order setting out conditions for future transactions by the firms. The action, which was instituted last fall, resulted from the sale to a foreign carrier of some Convair 340's which had originally been ordered by NEA. Prior CAB approval of the change in plans had not been obtained. The order ending the case also requires application for approval of relationships between Atlas, Northeast, The Babb Co., and Titeflex, Inc.

Elsewhere on the business scene:

American Airlines reports a net profit of almost $5.5 million for the first nine months of 1954. This figure, which includes $1.1 million from the sale of five DC-4's, is less than half of the total for the similar period in 1953. The 25-day pilots' strike is cited as responsible for a $2.8 million loss. A quarterly 87½¢ dividend will be paid Dec. 1 on cumulative convertible preferred stock.

Thompson Products reports net earnings for the same period of $8.8 million, up from the 1953 figure of $7.5 million. Sales fell off in the interval —from $246.1 million to $203.5 million. Directors declared a 35¢ dividend on common stock, which had been split two-for-one.

Western Air Lines earned an estimated $732,000 during the third quarter, up from $636,000 in 1953.



PRODUCTION AT ITS PEAK: At Convair in San Diego three types of Air Force trainers and transports move down the line. Shown are T-29C and D flying classrooms and C-131A Samaritan air evacuation transports—all based on the Convair 240.

Glenn L. Martin Co. has voted its first dividend in eight years. Cash dividend of $1 per share and a common stock dividend of 10% are payable December 13 and 15, respectively. Net earnings (before taxes) for the first nine months were almost twice those of the same period in 1953: From $7.36 million to $14.5 million. Income per share rose from $3.45 to $6.39.

United Air Lines reports record net earnings for the first nine months of $8.4 million, up from 1953's $8 million. Passenger, freight, and mail traffic hit new highs. Operating revenues rose 13% and expenses, 14%.

Capital Airlines reports nine-month operating revenues of $35.9 million for the period ended September 30, operating profit of $1.5 million, and net profit of $1.01 million. Earnings per share of common stock were $1.28 for the period.

Delta-C&S Air Lines netted $171,000 during that quarter, on operating revenues of $13.2 million. A dividend of 30¢ a share will be paid Dec. 6, the fourth dividend paid in 1954.

British European Airways reports a loss for the fiscal year ended March 31 of almost $5 million. Low coach fares are cited as the main reason. BEA's Viscounts, however, were credited with a net profit of $843,000 during the year. Subsidiaries of BOAC were mostly in the red. **Gulf Aviation** and **International Aeradio** brought in profits of $249 and $13,661, respectively, but net losses were suffered by **Aden Airways** ($393,666), **Bahamas Airways** ($53,340), **British International Airlines** ($6,213), and **British West Indian Airways** ($55,902).

The Flying Tiger Line took a loss during the fiscal year ended June 30 for the first time since 1948. Net profit of $1.9 million in 1952-53 became a loss of $425,545 in 1953-54. End of the Pacific airlift and delays associated with the Slick merger were cited as reasons.

Fairchild Engine & Airplane Co. Nov. 1 paid a dividend of 30¢ to shareholders of record October 20. The firm has 2.9 million shares outstanding.

Cessna Aircraft Co. will pay a semi-annual dividend of 25¢ a share, plus an additional dividend of 25¢, on Dec. 15. Over 731,000 shares are outstanding.

North Central Airlines has sold approximately $225,000 of its $300,000 issue of convertible debentures.

Aircraft Industries Association reports that the west coast area during the second quarter of this year employed 260,000 in a plant area of 58.9 million square feet, turned over a weekly payroll of more than $24.7 million, and had accumulated a backlog of $5.76 billion in orders.

Equipment

Boeing Airplane Co. has set a figure of $4.5 million as the price tag on its 707 jet transport. Airlines and military will get a slightly stretched version of the prototype.

Fairchild and Fokker estimate that the price of the Fokker F-27 short-range transport would be in the neighborhood of $462,000 for a production run of 150. U. S. customers would most likely be the trunk lines, who are reportedly showing leanings toward the high-wing, turboprop design.

Handley Page sees $350,000 as the price for its "DC-3 replacement," the Herald, assuming a production run of only 70. Earlier estimate had been $280,000 on 100.

Linea Aeropostal Venezolana has taken delivery of its first Lockheed Super Constellation (Model 1049E). Two of the turbo-compound-powered aircraft will be used in route extensions planned by the Venezuelan carrier.

Contracts

Sikorsky Aircraft Div. of United Aircraft has received $64 million in orders for Army cargo helicopters. Announcement of the order, placed by the USAF, mentioned S-56's; some S-58's may also be involved.

Lockheed Aircraft production of C-130 cargo planes at Marietta, Ga., will be extended into early 1957 as a result of a recent USAF order.

Goodyear Tire and Rubber Co. has received the first USAF order for tubeless aircraft tires. They will be used on the nose wheel of the Republic F-105.

AiResearch Manufacturing Co., a division of The Garrett Corp., will build 203 BuAer gas turbine compressors for $3.9 million.

Lear, Inc., will supply the USAF with $3 million worth of MB-2 autopilots for the Republic F-84F.

Beech Aircraft Corp. will build an additional $1.8 million worth of wings for the T-33A jet trainer, under subcontract from Lockheed, extending such production into fall of 1955. Beech completed delivery of 3000 such wings this spring.

Overhaul contracts include: **Temco Aircraft Corp.** to overhaul 87 Curtiss C-46's at Temco-Greenville for the USAF. **Lockheed Aircraft Service-International** to maintain and overhaul three Super Constellations for IBERIA Spanish Airlines. LASI will also inspect, maintain, and repair four of these aircraft for Seaboard & Western Airlines, under a three-year contract. **Northwestern Aeronautical Co.** of St. Paul, Minn., to overhaul Wright R-1820 engines for the USAF at one a day, beginning this month. The firm's P&W service territory now extends to Ohio and Michigan.

TIP TANKS FOR A CONNIE: When TWA gets the first of its order for 20 new turbo compound Super Constellations in February, it'll have two of these 600-gallon fuel tanks on its wing tips. This will mean a 600-mile range increase. Located in the nose but not visible is RCA's "weather eye" radar.

Facilities

North American Aviation is putting up a $1.2 million building for construction work on the F-100 at its main plant at Los Angeles International Airport. Operation is scheduled for mid-February.

Union Carbide and Carbon Corp. is erecting a $31.5 million plant to produce titanium sponge under a GSA contract.

Wiesner-Rapp Co., Inc., Buffalo, N. Y., has set up an affiliate, the **Titanium Products Corp.,** to continue research now under way in titanium fabrication problems.

Rohr Aircraft Corp. is establishing an assembly plant near Marietta, Ga., which will provide power packages for the Lockheed C-130 cargo plane. Component parts will be manufactured in California.

Lake Central Airlines has signed a lease on a large portion of a new $700,000 hangar and office building at Indianapolis.

General

Lund Aviation Corp. has been formed by Ed Lund, for many years with the Babb Co. Associated with him is Howard Hartman. Address: 247 Park Ave., N. Y.

The Garrett Corp. has established permanent eastern headquarters at 261 Madison Ave., N. Y. In charge is Frank Miles, v. p.

Resort Airlines, Inc., (Del.) has acquired all the assets of Oil, Inc., and Oil and Gas, Inc., in exchange for 5% preferred Resort stock. The Delaware corporation controls 85% of the stock of Resort Airlines, Inc., (N. C.).

California Central Airlines creditors will choose a general manager to run the airline and its affiliate, Airline Transport Carriers, to prevent the naming of a receiver. The organizer and president of the airline Col. C. C. Sherman, and his wife, Edna K. Sherman, may remain on the payroll.

Fairchild Kinetics Div. has been set up by the Fairchild Engine and Airplane Corp., with offices at 1860 Broadway, N. Y. The new unit results from the absorbing of Gassner Engineering, a consulting organization which has, among other projects, engineered two lightweight trains.

New CAA Rules Revise Export Procedures

Both the authority and responsibility for certification of U.S. aircraft and aeronautical products for export has been shifted by CAA to industry in a complete revision of export procedures spelled out in Aviation Safety Release No. 389. The new ASR, which becomes effective immediately also sets up a special class of CAA-approved repair stations to process approval of export equipment.

Detailed rules governing future handling of aeronautical exports are specified in CAA Manual of Procedure 2-4 available from the Supt. of Documents at 55¢.

Sole authority for decision in CAA enforcement cases now rests with its general counsel's office under new procedures approved by Administrator Fred B. Lee. Since 1947 this authority has been split between the general counsel and the office of aviation safety.

Future enforcement cases, with the exception of those involving scheduled air carriers, will be handled regionally. Violations affecting scheduled carriers will still come to the general counsel.

BUSINESS AIRCRAFT HITS NEW HIGHS

BY LOIS C. PHILMUS

DALLAS—The seventh annual convention of the National Business Aircraft Association, held here October 27-29, broke all records with a registration of over 400 members and industry representatives. It was the widest industry recognition of the business flying group yet experienced, with aircraft and component and accessories manufacturers going all out in exhibits and sponsorship.

The greatest interest of the three-day session was centered on new aircraft designs and conversions. Most discussed were the Convair transports, both 240 and 340. It was estimated that there were about 17 to 20 Convairs pressed into executive service in the past year or so. R. James Pfeiffer of Convair announced that Long, Parker and Associates had been named representative for Convair in sales to the corporation operators.

Pfeiffer stated that Convair felt its equipment was limited in its adaptability to the executive market because of initial cost and subsequent upkeep. He stressed and urged the group to make the most careful analysis possible before deciding on his company's equipment. "The margin of successful operation is quite narrow," he said.

Despite this somewhat pessimistic attitude the NBAA group showed increasing interest in the equipment. One company was expecting delivery shortly on a 340 which was in AiResearch Aviation for conversion. It was reported that total cost of the aircraft plus conversion and installation of all equipment would hit $800,000. A completed 340 interior converted for Long, Parker and Associates by AiResearch was on display.

As the pilots viewed the largest aircraft exhibit for executive use at Love Field less and less talk was heard about the "ideal" aircraft, as in year's past, although many still favored such a design within economic bounds.

Of particular note were:

• First production model of the Learstar—Lodestar conversion designed by William P. Lear.

• First U. S. showing of the de Havilland Heron, four-engine, eight-passenger British executive aircraft.

• The Royal Gull amphibian which is being built in conjunction with Italy's Piaggio aircraft firm and the Royal Aircraft Co., subsidiary of Kearney and Trecker of Milwaukee. The plane is slated to sell for $65,000 with the first production scheduled for December.

• Grand Central Aircraft's plush Skyrama, specially designed DC-3 conversion was an eye-catching addition.

Helicopters were very much in evidence with Bell Aircraft introducing its first two executive designs. One, a three-place executive transport, is fitted out with a custom interior. The other, a four-place utility, can be converted from passenger service to cargo to ambulance with five-minute adjustments.

Vibration has been reduced considerably. Bell expects to be in production in 1955, with the tooling on the three-placer already under way. Estimated cost is about $40,000.

Navigation equipment was much in evidence with the Collins Magnetic Amplifier equipped autopilot shown with a price tag of $20,000. The Lear Arcon, automatic single-axis stabilizer, which also operates on magnetic amplifiers, was available for demonstration flights. Production is slated for next month and it carries a cost of $895 with an average installation price of $50. Other highlights of the meeting:

NBAA awards

• Special award for 1954 went to Donald M. Stuart, director of the technical development and evaluation center of CAA at Indianapolis "in recognition of his substantial contributions to the progress of aviation in the development of air navigation systems and devices." Charles Lindbergh received the award in 1953.

• Special citations for outstanding contributions to business flying were presented to: R. T. Amis, Jr., president of Aero Design and Engineering Co.; Mrs. Olive Beech, president of Beech Aircraft; Dwane Wallace, president of Cessna; William T. Piper, Sr., Piper Aircraft; William P. Lear of Lear Inc. Citations are for "initiative, exemplifying true free enterprise in the development and production of modern multi-engine aircraft designed primarily to meeting the requirements of business flight operations."

• Safety Awards: Twenty-one companies which flew a total of 37,927,538 miles without accident or injury, were honored with meritorous safety awards. Service Pipe Line Co. of Tulsa came out with the highest total of accident-free miles with 4,724,555.

• Sixty-eight pilots received pilot safety awards on behalf of their companies for pilot crews which flew 500,000 or more accident and injury-free miles. Nelson Rokes of Proctor and Gamble accepted the top award for 2,750,000 accident-free miles.

• Organization: A resolution was passed to study a reorganization of the Association which, sources report, would call for strengthening the position of regional representatives. It would empower them to act decisively in matters affecting business operations in their respective regions.

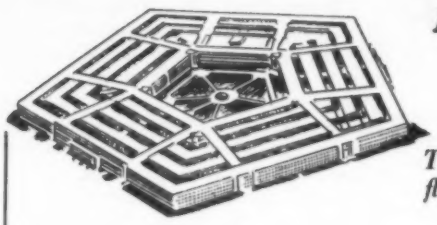
• New officers: Henry Boggess (see box) was elected chairman of the board, succeeding Cole Morrow who held the post for three years. Vice chairman is Ralph E. Piper of Monsanto Chemical. Treasurer is Gerard J. Eger of International Harvester. • • •

Man on the Cover

Henry W. Boggess, newly elected chairman of the board for the National Business Aircraft Association, is the "overseer" for Sinclair Oil's fleet of 20 aircraft. He is director of aviation for all Sinclair companies and personnel manager for Sinclair Oil & Gas Company, based in Tulsa.

A commercial pilot, he has been active in NBAA affairs for several years. He served as vice chairman until succeeding Cole Morrow last week, and was responsible for setting up recommended accounting methods for the Association presented at the 1953 convention.

He has been with Sinclair in various capacities for over 25 years. Active in safety affairs, he has been a member of the board of directors and executive committee of the National Safety Council for eight years. He is past chairman of the Petroleum Section of the National Safety Council and past president of the Oklahoma Safety Council. He has lectured at the University of Tulsa, Oklahoma A&M, and University of Oklahoma.



A MILITARY COMMENTARY

By Harry S. Baer, Jr.

There are limitations to both the flying boom and probe-drogue flight fueling systems—but apparently there's a place for both

WITH A SUBSTANTIAL Air Force order for Boeing KC-135 jet tankers, in-flight refueling has become big business—not only for the tanker aircraft manufacturer, but also for the two U. S. producers of flight refueling systems.

The KC-135, which will evolve from the Boeing 707, will use Boeing's flying boom system, a method which employs a controlable, telescoping pipeline extending from the tanker to the receiver. Although a more streamlined version for such a high-speed aircraft as the KC-135, it will be basically the same as that in use by Boeing KC-97's in their refueling role for Strategic Air Command bombers.

The other in-flight refueling system is known as "probe and drogue" and is manufactured by Flight Refueling, Inc., Baltimore, Md. Incorporating a hose for the link, this technique has been given increased attention by the AF, which has placed sizable orders for probe-drogue equipment.

Why did the flying boom get the nod over probe-drogue for SAC's KC-135? There have been numerous discussions about the merits of one system against the other, but at this point the future of these systems during the next few years is fairly well set.

In brief, it shapes up like this: SAC will stick with flying booms. Tactical Air Command and the Navy will use probe-drogue.

The boom came first

The flying boom, which was in on the ground floor in AF aerial refueling, has become the standard unit for SAC, and at this stage it would be virtually impossible to switch systems.

Although AF and even Boeing officials agree that recent developments in the probe-drogue technique offer certain advantages over the flying boom, such advantages would not come close to offsetting the time and great expense of changing SAC's procedure.

Boeing Airplane Co., Seattle, Wash., did a masterful job in the speedy development of the flying boom back in 1948. Since this equipment became operational in 1949, it has been fulfilling SAC's in-flight refueling requirement in good fashion and will continue to do so for the foreseeable future.

When the AF asked Boeing to come up with a refueling system, the company studied some 100 methods, including use of a hose. Ted Martin, Boeing manager-military sales, who has been on top of the U.S. in-flight refueling picture since 1949, said that Boeing at that time could come up with a working system in the boom much more quickly than it could have developed the hose system "which then had too many unknowns." And rapid development was a top priority.

"I have every reason to believe that, given sufficient development emphasis, the probe-drogue would have come out better than—or at least equal to—the flying boom system we are now using," Martin added.

Martin pointed out that Boeing's primary interest in flight refueling was to build tanker aircraft, adding that the company would, of course, employ any type of refueling system in its planes that the customer (the AF) requested. And the AF requirement for SAC has been for the flying boom.

The flying boom is a telescopic boom mounted in the tanker. Contact with the receiver aircraft is made under control of a boom operator, who manipulates the boom through use of ruddervators and guides it into a receptacle on the receiving plane. Once contact is made, the boom is freely telescoping and is completely automatic.

The boom method, of course, has certain limitations. Some of these were pointed out by Lt. Col. Walter P. Maiersperger, an AF expert on flight refueling matters who is in the Directorate of Research and Development, HQ USAF.

Maiersperger noted that there is a drag penalty with the boom since it is not stowed internally. Also, it lacks certain all-weather capabilities since in very gusty weather it is sometimes difficult for the aircraft to maintain contact in a refueling operation. He added, however, that "the boom does a good job most of the time."

On the other hand, the probe-drogue technique does not have these limitations—but it still has its problems. Says Maiersperger, "it is not optimum from a fuel flow standpoint." This is because the hose is appreciably longer and smaller in diameter than the flying boom.

And then probe-drogue

In the probe-drogue method, a conical drogue is trailed at the end of a length of refueling hose. Drag of the hose and drogue is almost balanced by a drive mechanism on a reel within the tanker, which continually winds the hose. In a refueling operation, the receiver pilot flies a probe, rigidly mounted to his plane, into the drogue, where automatic coupling and refueling takes place.

Obvious advantages of this technique are the speed and ease of contact, plus the fact that more than one aircraft can be refueled simultaneously from the probe-drogue tanker. In addition, probe-drogue is played up as requiring no extra or specially trained crew to accomplish the refueling mission.

With its multiple refueling capability, probe-drogue has an important edge over the boom for fighter aircraft, and the AF's Tactical Air Command will put this advantage to use.

As Roger Lewis, Assistant AF Secretary (Materiel), put it: "The fighter pilot likes to maintain complete control and maneuverability of his plane so probe-drogue is better for fighter refueling. As for SAC's bombers, the flying boom will be used because of our experience with the system and Boeing's work in this field."

• • •

AAC Recommends Convertiplane Speed-up But Enthusiasm Is Lacking

By Joseph S. Murphy

ANY HOPES among convertiplane supporters that the long overdue report of the Air Coordinating Committee's Convertiplane Working Group would signal the start of stepped-up development for this newer brand of flying machine might well have been harbored in vain.

ACC has released its report and the committee does recommend accelerated development by the military services. But on the whole, it is far from a strong document that would assure the convertiplane some definite future role in civil and military aviation.

Instead the 58-page report is marked almost from start to end with phrases of apprehension as to convertiplane's future and with qualifications which limit the path of development to be followed. Examples are these final recommendations:

- To the extent practicable, present activities of the military and other organizations (presumably the National Advisory Committee for Aeronautics) should be accelerated.
- Consistent with national security requirements, military developments should be undertaken so as to yield eventual benefits for civil use of convertiplanes.
- Civil government agencies should be given full opportunity to advise the military of civil requirements so they may be taken into account *to the extent possible* in military development programs.
- Civil agencies should be given *maximum possible* access to results of military development work so that the information can be put to the fullest use for civil purposes.

But on the subject of transport convertiplane designs the ACC recommendations took a stronger stand. While recognizing that basic responsibility for developing commercial designs rests with private industry, it called for military compliance with civil airworthiness standards for types which need not perform special military missions. It further recommended that a program of simulated airline operation, supported in whole or in part by federal funds, be considered as soon as satisfactory transports are available.

Much of the explanation for the "toned-down" recommendations finally adopted by ACC is evident in the conclusions of its working committee study. Although it finds that the convertiplane *appears* to have a significant potential utility *in the long run* for military, civil defense, and commercial operations, it judges the present technical or economical knowledge just not sufficient to fully evaluate its full potential or the pace at which it can be developed.

Drawing of Bell Aircraft's convertiplane, under construction and scheduled for early flight testing, was made from sketch in the ACC report. Engine in fuselage drives operating rotors through a gearing system which permits rotors to move from horizontal to vertical plane.

The convertiplane defined

But if the report of the ACC committee accomplishes nothing more, it has defined the convertiplane. Faced with the consideration of about every type of aircraft capable of near-vertical take-off and high-speed level flight, early in its study ACC arrived at this definition: *"The convertiplane is a combination of the principles of the helicopter and the airplane in which take-off, hovering and low-speed flight are achieved by a powered rotor; higher speed forward flight thrust is provided by a propeller or other propulsive device and lift by a fixed wing or fixed wing-rotor combination."*

Areas of military and civil convertiplane potential seen by ACC, but only *if effective and efficient types can be developed,* are:

U. S. Air Force—Major role would be as a support aircraft in troop carrier operations. Here the convertiplane would dispense with the parachute drops necessitated by today's operational transports, the open approaches and fairly smooth landing areas still required by newer assault transport, and the slow speed of helicopters.

Navy—Most obvious application is an assault troop carrier as developed by the Marines at Quantico and refined in Korean combat. Here again the convertiplane's speed makes it more attractive than helicopters presently being used, allowing a wider dispersal of assault equipment without jeopardizing the ability of the attacking forces to concentrate on an objective. As with the USAF, smaller designs would speed up air-sea rescue missions, and serve the added Navy role of anti-submarine operations in convoy movement.

Army—Stringent landing field requirements imposed on all Army special purpose aircraft have brought most convertiplane development emphasis from this service. Potential uses range from normal reconnaissance, staff transportation, limited aerial supply, and emergency evacuation to wire-laying and camouflage inspection. If the higher cruising speed of the convertiplane as an "aerial truck" can be realized without undue penalty, the Army will also support the cargo convertiplane as an improvement to its basic rotary wing program.

Civil Defense—Movement of rescue forces, medical supplies, food, and water into an urban area after an atomic blast is a potential problem that only a cargo transport helicopter or convertiplane would meet. Judgment is that the convertiplane could perform the mission on an area basis better than the helicopter.

Effective competitive position of the convertiplane in commercial operations, ACC reports, should fall within trip distances of 150-700 miles. In a comparative study of a 200-mph and a 250-mph convertiplane, a 170-mph (DC-3) and 250-mph (Convair) aircraft, and two transport helicopters (90-mph and 140-mph), results showed that while the advantage of the 140-mph helicopter over the 250-mph aircraft is limited to a range of about 275 miles, a 200-mph convertiplane would hold its advantage to a point beyond 800 miles.

Assuming that a premium passenger fare would be justified in saving 20-25% in air time plus ground transit time, ACC's study also showed that a 200-mph convertiplane would offer a salable service at ranges up to 300-400 miles, and a 250-mph version up to 600-700 miles.

However, the report sees commercial convertiplane use still roughly 10 years away and believes it will evolve from military developments. In the interim, it suggests that exploratory services with current types of small rotary wing aircraft be conducted to build up public acceptance, investigate operating problems, and generally advance the state of the art. • • •

NEW AiRESEARCH GAS TURBINE COMPRESSOR

Starts Jet Engines in Seconds

This new AiResearch gas turbine compressor (GTC85) will start the latest 10,000 lb. thrust jet engines within *seconds*.

Mounted on a Jeep for easy transport, it is shown starting one of the latest U. S. interceptors, the Convair F-102.

The AiResearch GTC85 has fully automatic controls. Its two stage compressor is *surge free*—even from full bleed to no bleed. It can be restarted instantly after switch-off in case of afterfire in the main engine. It has proven itself at high altitude, in desert heat of 130° F., and in Arctic temperature of —65° F.

In addition to the starting power, the AiResearch GTC85 can supply power and heat for ground refrigeration, ice removal, cabin preheat and for ground testing of ram air turbines. The GTC85 weighs less than 200 lbs.

Hundreds of AiResearch gas turbine compressors are now operating in the field. In the last ten years, AiResearch has accumulated more operational, engineering, production and testing experience in small gas turbine compressors than any other manufacturer. Model GTC85 reflects the improvements and increased reliability of this long production and service period.

THE GARRETT CORPORATION

AiResearch Manufacturing Divisions

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Designers and manufacturers of aircraft components: REFRIGERATION SYSTEMS • PNEUMATIC VALVES AND CONTROLS • TEMPERATURE CONTROLS CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS

The Railroads Have Opened Up on Their Chief Target — The Airlines

By WILLIAM V. HENZEY

(See editorial, page 17)

IN VIRTUALLY every Congressional district, most business publications, every transportation gathering, and on every occasion for a speech from here on out to an unknown climax, the nation's railroads will carry their message of being throttled by governmental policies which favor their so-called "subsidized competitors."

A chief target of this most extensive campaign is the airline industry. The current battlefront is that created last year by the Post Office Department's experiments with moving first-class mail by air.

The simplicity of the story that the government is taking mail from the railroads—"the back bone of our transportation system"—and giving it to the airlines makes for good grass-roots campaigning. Each Congressman is expected to get a thorough briefing on this situation before taking his seat in January.

With the first-class mail experiment as a wedge, it is generally believed that the railroads will seek much more far-reaching remedies for the financial ills which have beset their industry. They could, according to some top government people, hope to saddle the air industry with user charges or get federal financial help in some form of subsidies.

Airline mail a drop in the bucket

But whatever the stepping stone or the aim, two things appear certain in the maze of propaganda now circulating: The airlines' carriage of first-class mail is a "drop-in-the-bucket" challenge to railroad survival, and the railroads form an essential industry which must find a ground for preservation.

The airlines, after a belated start, are embarking on a grass-roots campaign of their own, and their message will be to justify the inevitability of moving first-class mail by air, and the relatively small effect an all-up mail program would have on the railroad industry.

There are various methods of figuring what the letter-mail market is, i. e., tons, ton-miles, revenues, etc. Generally, the picture may be viewed this way. The railroads in 1953 got $310 million in mail revenues. Service air mail revenues of the domestic lines which compete with the rails averages $35 million a year.

If the airlines got all the letter mail now being moved by rail, depending upon rates, the additional revenue to them would amount of only $15 to $25 million annually. The rails would keep the rest.

Railroad net revenues are down sharply and obviously the loss of $25 million would not help their cause. But, by the same token, the keeping of that $25 million would not solve their problem—or make a sizable dent in it.

Where the rails are hurting

There are two areas where the rails are hurting. In the passenger field, much traffic is being diverted to airlines, buses, and the private car. For the first six months of 1954, revenues from air passenger travel amounted to $433,987,000, while rails, including Pullman and commutation services, took in $375,224,562.

The other area where rails are suffering competitively is the freight field where serious inroads are being made by highway carriers.

The railroads argue that the PO's experiment with the airlines is having an effect on its passenger operations by forcing the idling of trains that otherwise might be justified if the first-class mail traffic were available. They have carried this argument to the CAB where it will be exploited in the coming year in an investigation of the surface mail rate levels of the airlines.

Not only are the railroads unhappy with the rates of the airlines, but the air carriers themselves are something less than enthusiastic. In many instances, the special mail rates produce less yield than do freight rates. Unlike air mail, surface mail moving in current experiments is moved on a space available basis. For the time being, then, it can be argued that the deferred service given justifies the low rates.

Between Chicago-New York, Washington-Chicago, along the east and west coasts, present and proposed rates range from 18.66¢ to 20.04¢ per ton-mile. Air mail rates generally are considered in the 45¢ range, although a cut to 41¢ in the near future appears inevitable.

Meanwhile, the overall seriousness of the railroads' condition may be seen in figures released recently by the Association of American Railroads. In August, the Class I railroads had an estimated net income of $64 million, or $17 million less than the same 1953 month.

For the first eight months of 1954, net income of those carriers—approximately 69 strong—dropped to $337 million from $571 million in 1953.

Thus, when the amount of revenue that figures in the first class mail fight is compared with that of the passenger and freight fields, it is apparent that that particular problem is in reality a minor part of the overall battle.

Problems are broad

James M. Symes, president of the Pennsylvania Railroad, recently indicated in a Pittsburgh speech that the problem of the rails is broad and can be alleviated by government help "at a cost that would not be noticeable to the American people." Among his suggestions were:

- Provide some form of tax relief for the deficit incurred by railroad passenger transportation.
- Provide federal aid for stockpiling railroad freight and passenger equipment for emergency use.
- Return the equivalent of the 3% freight tax and 10% passenger tax to the rails with the requirement that they match it, dollar for dollar, and earmark the combined funds for right-of-way maintenance.
- Permit private and contract carrier tonnage to move over the railways as it is now moving by air, highway, and waterway.

It appears almost crucial that the railroads achieve a healthy means of survival. To this end, Air Transport Association counsel Stuart G. Tipton recently submitted to the government a general plan under which solutions may be found to the rail problem.

But it is important to the airlines, the Post Office, and mainly the public which stands to save money and time, to preserve the progressive step taken by the PO in moving first-class mail by air. • • •

"The history of trade is a long road of unending struggle, and inevitably the weak and incapable give place to the strong and efficient. We wasted no pity on the stage coach and canal boat—we simply wrote them off our inventory. Nor should we now waste time with the railroads if they, too, have served only to be superseded by better modes and ways of doing the work for which they were designed. But we should be sure before, deliberately or otherwise, we cripple or destroy."—WILLIAM K. TATE, *vice president, Nashville, Chattanooga & St. Louis Railway.*

UNDER ONE ROOF
By James J. Haggerty, Jr.
(No. 2 in a series)

"Room for 70 football fields under this roof – room to build bigger bombers and transports"

Says James J. Haggerty, Jr., Aviation Staff Writer, Collier's

One football field covers more than an acre, yet in Marietta, Georgia, there's an aircraft plant with a single building that could house 70 football fields.

This statistic is just as important as it is amazing –important, of course, to U. S. defense. The plant was built big by the government for a purpose–to manufacture big multi-engine airplanes in quantity with utmost speed and efficiency.

Today GAP-6 (Government Aircraft Plant No. 6) is operated by Lockheed for the U. S. Air Force, is building big turbo-prop C-130A assault transports and six-engine B-47 jet bombers, more than half the parts being made under the same big roof. Another production line modifies early B-47's, and there's still room for a fourth production line.

GAP-6 is not just big for bigness' sake but for production efficiency. And the record made there in the last three years proves the advantage of "everything under one roof"... (1) first B-47 flown 60 days ahead of schedule; (2) subsequent and current production all on schedule; (3) now building planes with 25% of original man-hours; (4) learning curve now 73% and still going down, well under the 80% industry average; (5) third best safety record in the entire industry.

Already a vital part of America's defense industry, GAP-6 can easily produce even more and bigger planes for U. S. protection.

U.S. Air Force *Govt. Aircraft Plant No. 6*

Lockheed *Aircraft Corporation*

Georgia *Division, Marietta*

(a Lockheed advertisement)

Smooth "High Road" to

SMOOTHEST and most efficient offshore crew transportation today is the modern helicopter, an aircraft proved in this tough assignment and backed by many millions of hours of operation throughout the world.

Around the clock, dependable Sikorsky helicopters now provide new speed, safety, seasick-free comfort and high availability in the transportation of operating personnel between the mainland and offshore stations.

The pictures on these pages tell the story. They illustrate the smooth "high road" to offshore drilling barges in the Gulf off Texas and Louisiana.

1. **OIL CREWMEN** and their baggage are weighed in before boarding an S-55 for a 30-minute flight from the mainland to a barge 45 miles out in the Gulf.

2. **S-55 HELICOPTER,** loaded with offshore crewmen, takes off from the heliport on a Grand Isle office parking lot.

3. **THIRTY MINUTES** later the Sikorsky comes in for a gentle landing on the flight deck 45 miles from Grand Isle, Louisiana. By boat, the trip takes tiresome hours.

Offshore Drilling Barges

Petroleum Helicopters, Inc. of New Orleans, demonstrates how offshore transportation can be speeded . . . how problems can be eliminated or greatly simplified . . . how costs can be reduced. Already as many as 110 men per day fly to work offshore for a major oil company. Intangible values include higher morale, greater safety and availability of an emergency vehicle without peer.

For information on how your company can increase the efficiency of its operations offshore, or anywhere, with transport helicopters, write on your company letterhead or call today to General Manager, Sikorsky Aircraft, Bridgeport, Connecticut.

5. PASSENGERS alight after safe, easy flight. The helicopter makes any number of required trips each day, handling a steady flow of passengers in each direction between several rigs and the mainland.

4. CONVERTED LST with flight deck aft easily accommodates the big Sikorsky helicopter. More and more ships and rigs are being equipped with such heliports. The helicopters eliminate the need—and cost—of standby safety boats at drilling rigs.

Sikorsky Aircraft

BRIDGEPORT, CONNECTICUT

One of the Divisions of United Aircraft Corporation

ED HEINEMANN TELLS HOW TO CUT OFF THE FAT

With examples and statistics El Segundo's engineering boss shows that design simplicity saves buyers' dollars

BY WALTER A. KILRAIN

ONE OF THE MORE memorable phrases in recent years was Defense Secretary Johnson's assertion that he was "cutting fat, not muscle" from the Air Force. The same claim can be made (perhaps more appropriately) by a man whose name has become synonymous with paring excess pounds off aircraft—Ed Heinemann, chief engineer of Douglas-El Segundo (AMERICAN AVIATION, October 11. Last month Heinemann gave the Society of Automotive Engineers a short course in how to lose weight without resorting to surgery.

The high performance requirements of modern aircraft and the ever-growing mass of military equipment which must be fitted into them are the two basic reasons why aircraft keep getting bigger and heavier, declared Heinemann, whose A4D attack bomber is now the smallest U. S. combat jet.

How a pound multiplies

It has become axiomatic that whenever a pound of military load (armament, instruments, etc.) is added to an airplane it must be multiplied by a "growth factor" to discover how much the weight of the entire plane will be increased. With a growth factor of 10, one extra pound of equipment adds 10 pounds to the plane's gross weight because of the necessary additional fuel, beefing-up of structure, etc. But this is not the end of the designer's dilemma. As performance requirements become more exacting, growth factors grow. Yesterday's factor of 10 may become 15 or 20 tomorrow.

If the average pound of airplane costs $50 to develop and produce, one added pound of military load, when multiplied by a factor of 10, means $500 to the manufacturer, the military purchaser, and, eventually, the taxpayer. If the factor becomes 20, the price tag becomes $1000.

It'll take time

Such facts, Heinemann points out, justify the expenditure of some engineering time to avoid adding that pound. The manufacturer is not the only one who must remain uncomfortably aware of what growth factor means in terms of pounds and dollars. He must also help educate the military buyer, leading him to consider "not only what is possible, desirable, and necessary, but also what is practical, either now or in the near future."

Three ways the manufacturer can oppose the trend toward giantism are: (1) By taking advantage of advances in the state of the art; (2) by simplification (or outright elimination) of components; and (3) by making the most of what Heinemann calls "discontinuities in growth factor." *(This last is typified by the A4D, which, already scaled down in size and weight to a certain point, was able to dispense with folding wings. This further reduced its gross.)*

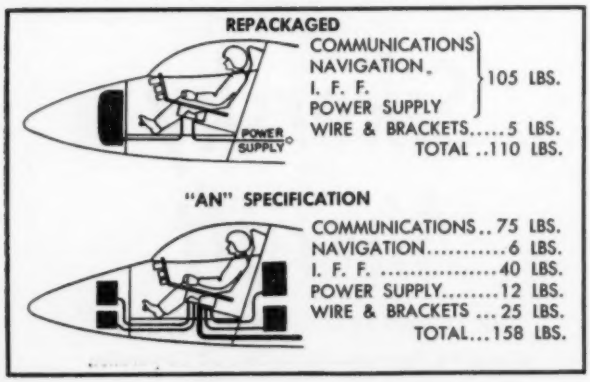
SAMPLE: Heinemann shows how 172 pounds of electronic equipment (scattered in foreground) was repackaged into one aluminum container weighing only 136 pounds in the new Douglas A4D attack plane for the Navy.

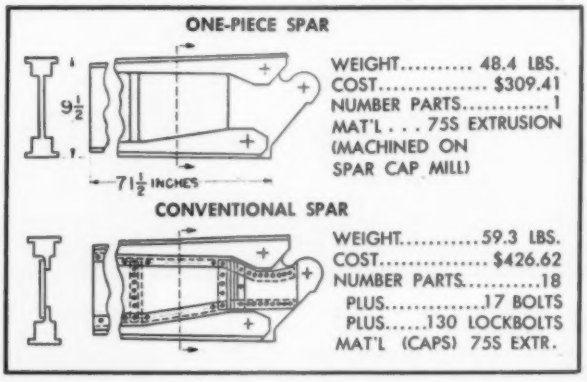
Advances in the state of the art include various bits of design ingenuity. Use of new materials, such as titanium, is one approach. Machining complicated sections in one piece instead of building them up from separate parts is another. Basic to design economy is the practice of making each component do as many jobs as possible: Wing structure that serves as an integral fuel tank; a tail wheel that incorporates an arresting hook for carrier landings. Using one large engine instead of several smaller ones may also reduce weight as may a three-wheeled instead of a four-wheeled landing gear.

Choosing an engine

Ingenuity may also find its expression in engine choice. The designer will seldom, if ever, find just the engine he needs for a particular plane, warns Heinemann. He will have to make do

TWO TECHNIQUES FOR SIMPLICITY: left, rearrangement of components in design; right, use of one-piece milling in manufacturing.





ANNOUNCING

RCA's New Weather-Mapping Rada

Airline operators have long sought a means of avoiding the time delay caused by storms across their routes, and for improving passenger comfort when storm penetration is advisable and practical.

RCA, in conjunction with major U. S. airlines, has developed a weather penetration radar system designed to "see" into storms and pick non-turbulent paths through or between them, making long and costly detours unnecessary.

This new system—RCA's AVQ-10 Weather Detection and Reconnaissance Radar—is the first airborne radar to use C-band (5.6 cm) transmission, the frequency best suited for "looking into" storms. It presents the pilot with an easily interpreted display of storm conditions surrounding him. The ground mapping feature, which it also offers, gives valuable terrain clearance information. It is conservatively designed to provide the reliability so necessary for airline operations. The five units included in the AVQ-10 (receiver-transmitter, accessory, antenna, indicator and control panel) weigh a total of about 133 pounds.

This is another example of the many important contributions that RCA has made and is continuing to make in the field of electronics. Every feature of the AVQ-10 is firmly grounded in RCA's electronic and engineering experience. Airline and private plane operators are invited to ask for more complete information.

COMMERCIAL AVIATION SALES
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DIVISION CAMDEN, N. J.

LIGHT APPROACH to ejection seats brought the differences shown above. At left, the XF4D-1 seat; at right, stripped down A4D-1 seat.

with what is currently available in the thrust range involved. Within these limits the designer is faced with a compromise between specific weight and specific fuel consumption.

"It is perhaps significant that up to the present time," Heinemann notes, "engines with the best fuel economy, even though somewhat heavier than their less economical competitors, have turned out better, even for short-range airplanes."

Compatibility between airframe and engine is a problem. Excess weight may result if the design speeds of airframe and engine are not matched. An engine designed for high sea-level speeds may add unnecessary pounds to a high-altitude interceptor.

Simplification may sometimes begin with safety systems. "There have been many instances," says Heinemann, "where, in order to increase the reliability, secondary systems have been added, and it has turned out in the final analysis that the reliability of the basic system has been reduced by the secondary. In many cases it has been found that for the same total amount of engineering effort expended, the primary system could have been developed to a much higher degree of safety."

Lightening up on accessories

Accessories and equipment are another field that is ripe for application of weight-saving principles. Some results of efforts along this line are shown in the accompanying table and photo. Other successes include:

- Electrical plug and receptacle: 41 parts used to weigh 0.20 pounds in old design; new design with 18 parts weighs 0.018 pounds, a saving of more than 90% in weight.
- High-pressure coupling: Old design with five parts weighed 1.66 pounds; new design with three parts weighs only one-half pound, a saving of more than 60%. A switch from aluminum to stainless steel also made possible high-temperature operation, in addition to the weight saving.

Weight saving through simplification will bring increased reliability, in addition to its other benefits. The greater the number of parts, the lower the reliability of the complete unit, assuming all parts are in series. If each individual part is 95% reliable and there are 10 in a unit, the unit's reliability is 60%. If there are 20 parts, overall reliability drops to 35%. If there are 50 parts, reliability falls well under 10%.

The improved performance that the customer seeks to achieve by adding just one more device to the airplane may be more than canceled out by a drop in reliability that keeps the airplane on the ground instead of in the air when it is needed.

Production, as well as operation, benefits from simplification. Thanks to the increased efficiency and economy that follow volume production, the cost per airplane drops. For the price of 1000 airplanes weighing 30,000 pounds each, the budget-limited buyer could get 2400 planes at 15,000 pounds each.

For the designer who would enjoy these benefits Heinemann has one dictum: *Keep it simple.* • • •

HOW LIGHTER EQUIPMENT SAVES DOLLARS

Item	Previous Design Weight Lb.	New Design Weight Lb.	Weight Saving Lb.	Airplane Weight Reduction Lb.	Cost Reduction $
Air Conditioning Unit	17.5	5.5	12	120	6,000
Electronic Equipment	172	136	36	360	18,000
Ejection Seat & Tracks	98	40	58	580	19,000
Gun Sight	26	4	22	220	11,000
Change From 28 Volt DC & AC Electrical System to High Voltage 400 Cycle AC System	440	198	242	2,420	121,000
Oxygen Pressure Regulator	2.54	0.12	242	24.2	1,210
High Pressure Coupling 30 Per Airplane	50	15	35	350	17,500
Electrical Plug 40 Per Airplane	8	0.7	7.3	73	3,650

Based on Growth Factor-10 and cost-$50 per pound

PROCUREMENT NOTES

Reports are current that **selection of a new Comptroller General** will be delayed until after election when there may be a number of prominent Republicans available for the $17,500, 15-year-term prize political plum. Only the names of Mark Trice, Secretary of the Senate, and Frank H. Weitzel, Deputy Comptroller General, are now being mentioned.

AMC Instructions #70-272 for USAF buyers, used for **computing true depreciation cost allowances** is being rewritten. Draft of the proposed rules is not very satisfactory to industry.

The Office of Naval Materiel announces that all **letter contracts over two years old** have been converted into formal contracts. There were nine remaining at the end of the fiscal 1954. Navy backlog of letter contracts is now reduced to 74 valued at $673,566,00.

In establishing the **monetary inventory accounting system,** i.e., dollar value for inventory, the Air Force found that many of its air depots have supplies valued at more than $250 million. San Antonio Air Materiel Depot came up with an inventory of more than $1 billion.

The Bureau of Yards and Docks has charge of **building all U.S. military airports** in Spain. Navy already has a staff of inspectors and auditors there to prevent contractural scandals such as followed the building of the Moroccan airports.

Distribution of the 1400-page **Air Force Procurement Instructions** to USAF bases has begun. It becomes operative on Dec. 1, 1954, and supersedes all the procurement (70 series) manuals, directives, regulations, instructions, etc., now used by AMC. Orders should be sent to Superintendent of Documents, Government Printing Office, Washington 25, D.C. Price is $6.75. Already the first revision of over 200 pages (price $1.50) is being prepared. It will be completed before the main document becomes operative.

The Overseas Economic Operations task force of the Hoover Commission will soon issue a report sharply **criticizing the offshore purchasing policies** of the government. When added to the forthcoming special report of Assistant Secretary Roger Lewis on offshore aircraft purchasing, it could easily result in a major overhaul of our present policies.

Another vigorous effort is being made in the Pentagon to complete the new unified set of **regulations for progress payments** and sample contract clauses for progress payments. Thirteen sample standardized clauses are under consideration. Naval ship builders are demanding that provision also be made to allow for payment of profits on all contracts over a year old.

The Gold Room at a superb Buenos Aires hotel. Picture yourself there tomorrow feasting on tender Argentine beefsteak. *El InterAmericano* is the only daily DC-6 from the U. S. A. to Buenos Aires.

"Si, señora, smart people come to South America now because it's summer!"

Yes, seasons are reversed south of the Equator. When you fly with Panagra you can choose from 12 flights a week on the shortest way to Buenos Aires. You really don't know South America 'til you've seen its West Coast.

You'll lose your heart to Lima, Peru. Spanish Colonial architecture! Hotel rates as low as $3.50 a day! "South America has everything," say travelers who have seen it with the *World's Friendliest Airline.*

Love lobsters? They're called "Langostas" in Chile. At their best pulled fresh from the Pacific and boiled in sea water at Viña del Mar, near Santiago. Night life at Viña centers around the Casino. There's fabulous fishing near Santiago, too. Both deep-sea and fresh water. Only Panagra planes fly to Santiago from the U. S. A. Daily service.

For reservations on either luxurious *El Inter-Americano* or thrifty *El Pacifico* tourist service, call your Travel Agent or Pan American, Panagra's U. S. Sales Agent.

Pan American-Grace Airways **PANAGRA**
WORLD'S FRIENDLIEST AIRLINE

West Coast Talk . . . By Fred S. Hunter

- **Hughes still leads in fire control**
- **Lockheed's wing designs**
- **CAB take over affairs of state?**

HUGHES AIRCRAFT keeps right on pacing the field in production of automatic fire control systems. A radar unit that seeks out a target, locks on, and guides the fire power to deliver the finishing touch is a complex piece of business. Hughes got off to a fast start by putting together one that would work while others tried to design one that was perfect. Now its E systems monopolize the Air Force's all-weather interceptors, guiding the rockets for North American's F-86D, Northrop's F-89D, and Lockheed's F-94C.

The Hughes radar also is in the nose of Canada's CF-100 bomber interceptor. For this one, however, Hughes makes the nose, too. Latest production at Culver City is on a new E-10 system for two of the Navy's late-model interceptors, the Douglas F4D-1 and the McDonnell F3H-2N. Add to these the E-9 adaptation for air-to-air missiles for Convair's F-102 and you have a pretty fair job of covering most of the waterfront.

• •

LOCKHEED'S new supersonic F-104 not only has a thin, straight wing, but sharp edges. Very sharp edges. The two go together in Lockheed's design philosophy of the straight-wing configuration for high-speed efficiencies. Another interesting point on the F-104 is that it is said to be the first aircraft that's had the benefit of contributions to its design from all three of NACA's laboratories, Langley, Lewis, and Ames.

• •

TO OLDTIMERS in Alaska, the thought of a merger of Alaska Airlines and Pacific Northern Airlines is nothing short of sensational. They remember how the two carriers grew up fighting each other bitterly, with their business battles often becoming personal feuds between owners and employees, and even customers. "If the Civil Aeronautics Board can preside successfully over such a transaction, the agency might be qualified to take charge of the nation's problems in world affairs," observes the skeptical Anchorage *Daily Times* in editorially commenting on what it says "sounds like a bedtime story."

• •

COL. A. R. DEBOLT, former Air Force F-86D pilot who recently joined North American Aviation's customer relations department, is spelling off Engineering Test Pilot Bob Hoover in demonstrating the TF-86F trainer on the current sales tour of Air Force and Navy bases. A tour like this can get pretty rugged. North American started Hoover and DeBolt out with the TF-86F right after the Dayton air show. Indications are it will keep going right up until the time the Air Force evaluates the ship, probably in January. North American is working hard to sell this one and has very high hopes.

• •

LEAR, INC. is boosting esprit de corps of its workers by an inscription over the employee entrance of its new Santa Monica plant: "Thru These Portals Pass the Most Conscientious Workers in the World." It's a twist to an inscription about the most beautiful girls in the world etched over the stage door of the old Earl Carroll theater in New York years ago. "We put it up because we wanted to pay tribute to the contribution our workers make toward the progress of our company," said George Otis, vice president and general manager of the LearCal division. "All evidence indicates that our employees appreciate it, too," he added.

• •

CLARENCE BELINN, Los Angeles Airways president, thinks rotor-tip rockets could be even more important than two engines in the future development of helicopter operations such as his.

HOW FOREIGN LICENSING HELPS TURBOMECA

U. S. and British licensees meet engine demand while the French company continues development.

BY ANTHONY VANDYK

BORDES, FRANCE—With licensed production of Turbomeca gas turbines under way in the United States and starting soon in Britain, the powerplants originating in this little country village at the foot of the Pyrenees are gaining new international stature.

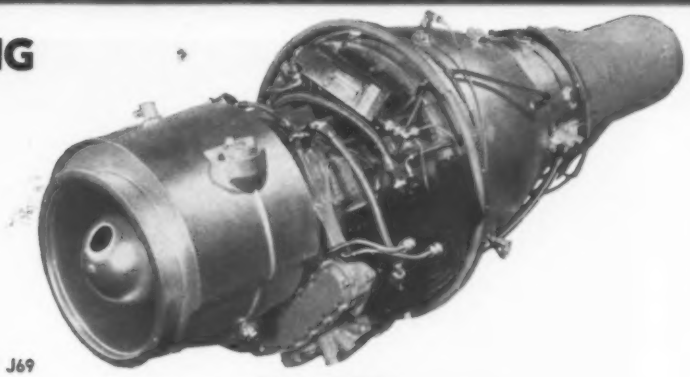
The licensing of engines to foreign manufacturers serves two main purposes. First, it enables Turbomeca to meet foreign customer requirements. Second, it frees Turbomeca to concentrate on design and development work.

The recently expanded facilities of the company are now adequate for the French market, but the 850-man Turbomeca team headed by Joseph Szydlowski is likely to continue to concentrate on improving existing engines and on developing new ones. Although Turbomeca has built over 300 engines, which have accumulated some 30,000 hours running time, the skill of the company is primarily in the design and development field.

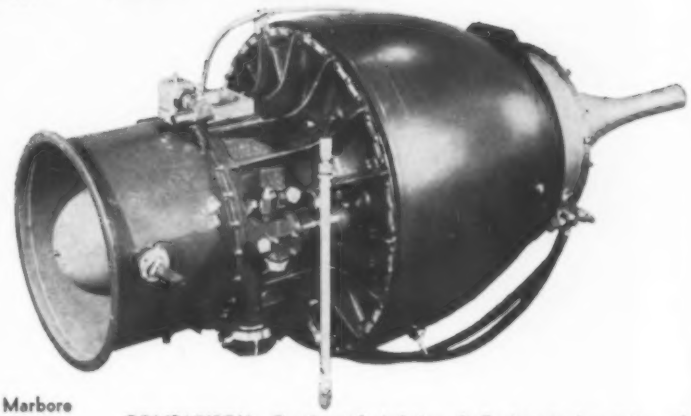
Profiting from Turbomeca's unique know-how in making the small gas turbine work in such diverse applications as jet propulsion, air compression, and the provision of shaft power, licensees have at their disposal designs which work. With this firm base they can use their own production experience to supply a powerplant which combines good design with customer requirements and producibility.

The "Americanized" Marbore

The two principal Turbomeca licensees, America's Continental Aviation & Engineering Corp. and Britain's Blackburn & General Aircraft Ltd., have very considerable experience in producing low-power piston engines. Both companies have made considerable changes to the French turbines to meet customer requirements and aid producibility. Continental, which has many millions of dollars worth of USAF contracts to build Turbomeca engines, has disclosed some details of how it has "Americanized" the Marbore turbojet which it is producing under the Air Force designation J69. The philosophy followed in this "Americanization" was to maintain the design intact by keeping changes to a minimum. The aerothermodynamic design features were maintained identical to the French so as not to jeopardize the performance characteristics of the engine.



Continental J69



Turbomeca Marbore

COMPARISON: Continental Aviation & Engineering's version of the Marbore is designated J69. The American engine has about the same performance as its French antecedent but weighs slightly more due to additional accessory drives and a more elaborate fuel control system.

To start with, all data and drawings had to be translated from French into English and dimensions converted from metric to English equivalents. Exact equivalents in bolts and screws were not available so either slightly smaller or slightly larger ones had to be used. Moreover, due to differences between French and American standards, sheet metal gauges were not quite identical, so that either a slightly thicker or thinner gauge was used.

In selecting materials for the J69 the aim was to reduce the content of critical materials. In France cobalt is much more plentiful than nickel whereas the reverse applies in the U. S. Consequently, for the turbine wheels a Nimonic 80-A alloy with a high nickel content was substituted for the cobalt alloy used by Turbomeca. For the other hot parts of the engine, nickel and chromium alloys of the same composition as used by the French were selected.

Machines vs. handwork

In modifying the Marbore design Continental scrutinized carefully all of the extremely close dimension tolerances from the American manufacturing standpoint. In France, where highly trained machinists are readily available, there is much greater dependence on hand-finishing methods and selective assembly to obtain close fits and contours than there is in the U. S., where parts are assembled with a minimum of handwork to permit low-cost manufacturing.

Accessory changes

To meet USAF requirements several major design modifications were made to the Marbore, including a new accessory arrangement, the addition of torch ignitors, and a new, more elaborate engine control system. To obtain larger generator capacity a 100-ampere, 28-volt Breeze starter-generator was mounted in the engine nose, enabling the J69 to be brought up to a cranking speed in 10 seconds or less. Provision was made in the new accessory arrangement for the addition of a hydraulic pump drive. Also incorporated in this new grouping of the accessories around the outside of the compressor inlet were drive pads for the tachometer, fuel pump, oil pump, and fuel control.

Continental is also building an American version of the Palouste air compressor and has experimentally "Americanized" other Turbomeca engines, including the Artouste I (XT51-T-1) and Artouste II (XT51-T-3) shaft turbines, and the Turmo II (XT-51-T-5) free turbine. Although details of the modifications to these units have

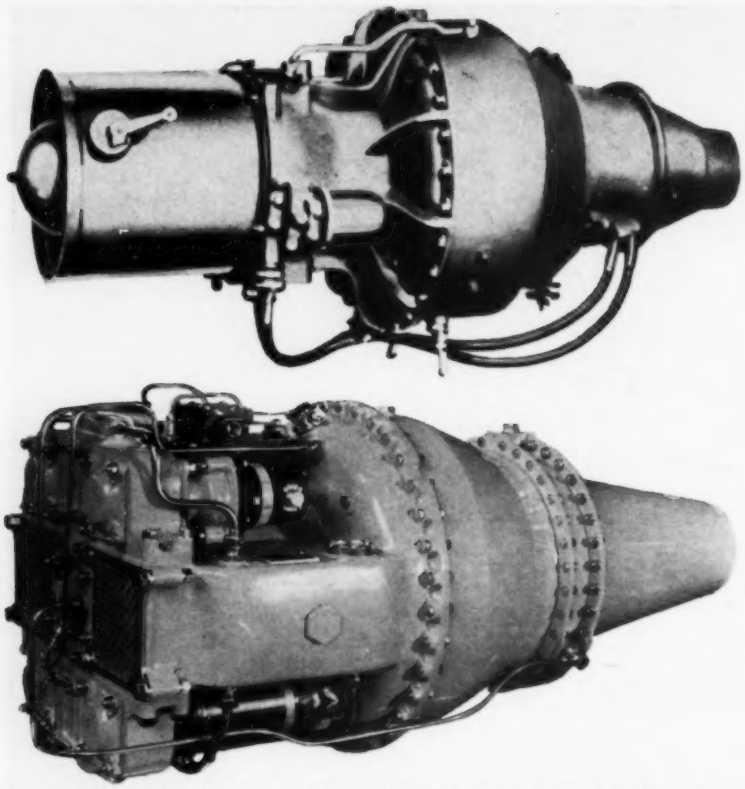

TIGER!

The silent world beyond sound is the scene of battle for the Navy Tiger. Grumman's new fighter slips through the "sonic barrier" as if air at the speed of sound were smooth instead of strange. Supersonic, she can make the fastest bombers prey for her missiles, or she can make an inland city the target of Navy attack carriers. Designed also for speed of production, the Tiger was built and flown in 15 months. Tigers for carrier operations will soon be in production.

Grumman

GRUMMAN AIRCRAFT ENGINEERING CORPORATION • BETHPAGE • LONG ISLAND • NEW YORK

Designers and builders also of Cougar jet fighters, S2F sub-killers, Albatross amphibians, metal boats, and Aerobilt truck bodies



ALIKE, BUT DIFFERENT: Blackburn & General Aircraft's British version of the Turbomeca Palas (below) looks very different from the French original (top). Among the modifications are bifurcated air intake casting and close-set starter and accessory mounting pads. The British engine is not yet in production.

Turbomeca—from page 41

not been disclosed, it may be assumed that they resemble those incorporated in the J69.

In Britain, Blackburn & General Aircraft Ltd. has redesigned the Palas turbojet and the Turmo free turbines and plans to carry through this modification program to the Marbore turbojet and the Palouste air compressor. The main changes in the Palas are the relocation of various accessories and the use of bifurcated intakes. Improved materials are also used.

Both Blackburn and Continental hope that by putting different types of materials into their engines from those used by Turbomeca, overhaul times of the licensed products will be higher than that of the originals. At the moment the French-built units run for only 150 hours between overhaul although it is expected that a higher figure will soon be permitted.

Turbomeca engines have been selected to power trainers, personal aircraft, and experimental planes in many countries of the world. Among the models using the French-designed turbines are the Cessna T-37, Sikorsky S-59, Ryan Firebee target drone, Short Sherpa, Miles Sparrowjet, Caproni F5, Ambrosini Sagitarrio, SNCASO Trident, SNCASO Ariel, SNCASO Farfadet, Fouga Magister, SIPA Minijet, and Morane-Saulnier Fleuret. • • •

HERE'S THE LINE-UP OF TURBOMECA ENGINES

The basic design concept is retained in all the Turbomeca engines. This includes single-stage centrifugal compression, a very compact annular combustion chamber, and single- or multi-stage turbines. The shaft drive is either an extension of the compressor turbine shafting or is separate from it and driven by a free turbine. The annular combustion chamber features rotating disc fuel distributor and burner.

Basically there are seven categories of Turbomeca engines: shaft turbines, jets, turbofans, turboprops, turbo blowers, free turbines, and air compressors. There are three *shaft turbines*: the 160-hp Oredon, the 280-hp Artouste I, and the 400-hp Artouste II. The first of the *jets* was the 220-lb.-thrust Pimene, but only a few of these were produced. The Pimene was supplanted by the Palas which gave 360 lbs. thrust for the same weight (120 lbs.) and size. The Palas is in quantity production at Turbomeca. A more powerful engine, designed in 1950, is the 660-lb. Marbore I. After 1000 hours' test-bed running this unit was developed into the Marbore II which gives 880 lbs. thrust for the same weight and size as the first model. Over 200 Marbore II's have been built.

Turbomeca's two *turbofans*—the 250-lb. Aspin I and the 800-lb. Aspin II—use the Artouste I and II shaft turbines, respectively. In the *turboprop* field there is the 400-hp Marcadau, an Artouste II shaft turbine fitted with a reduction gear box. The two Turbomeca *turbo blowers* are also modified Artouste shaft turbines —the Artouste I and II when directly driving a special compressor are known as the Arius I and II.

Turbomeca's two *free turbines*, the 300-hp Turmo I and the 400-hp Turmo II, comprise a Pimene (in the former) or Palas (in the latter) jet engine which is used as a generator together with a free turbine driving the output shaft through a reduction gearbox. The *air compressors* in the Turbomeca family are the Pimedon and the Palouste.

AEROPRODUCTS TURBOPROPS

have more flight time than any other American-made turbopropellers

USAF Convair YC-131C with Aeroproducts Propellers and Allison YT56 Turboprop Engines

Aeroproducts propellers are used by the U. S. Navy and Air Force on aircraft built by Douglas, Convair, and other great names in American aviation.

Allison Turboliner

The years of pioneering work which Aeroproducts and Allison have done are now paying off in the availability of Turboprop engines and propellers which enable military and commercial aircraft to carry bigger payloads farther, faster and more economically than ever before.

Believing in the future of the gas turbine engine, Aeroproducts began work on propellers for turboprop aircraft over a decade ago. When a small turboprop aircraft was flown for the first time in the United States in 1945, it carried an Aeroproducts turbopropeller. Today, Aeroproducts turbopropellers are America's most widely used because they have proved their quality and stamina on military aircraft and the Allison Turboliner.

Turboprops are just part of Aeroproducts' contribution to safer, more efficient flying. Aeroprops for piston-driven engines, for instance, have long since proved themselves among the industry's finest. And Aeroproducts' hydraulic and pneumatic self-locking actuators provide easy, accurate control of flight surfaces. A new air-driven emergency generator, now available, is another notable development by Aeroproducts.

GM GENERAL MOTORS

Building for today
Designing for tomorrow

Aeroproducts

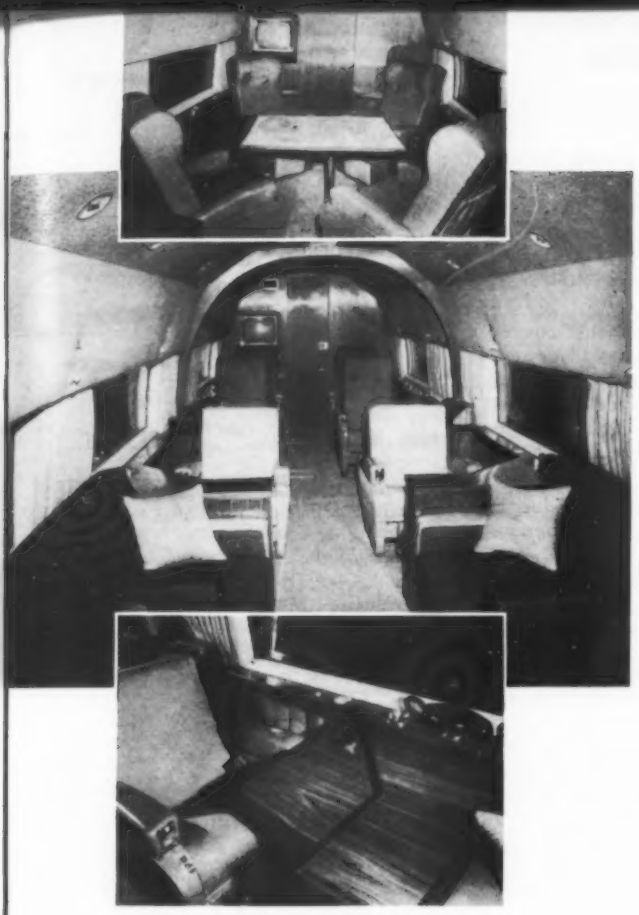
ALLISON DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO

BRITISH de Havilland Heron made its first U.S. appearance at the NBAA Dallas exhibit. The eight-passenger, four-engine Heron cruises at 183 mph, has 900-mile range, and gross weight of 13,000 lbs. Fore-and-aft seating arrangement (left) provides folding tables between seats.

THIS IS LIVING

Business aircraft became an industry at the NBAA convention in Dallas Oct. 27-29 (see page 28). Vying for attention were new aircraft designed for executive use as well as elaborate conversions of older types.

GRAND CENTRAL Aircraft's entry in the DC-3 conversion race, the Skyrama, provides a "sky room" for four right behind the pilots. Cabin design, an interior decorator's masterpiece, features specially-designed cabin dividers (below).



THE 100th DC-3 conversion by Executive Aircraft Service, completed at a reported $400,000, includes TV set, four swivel chairs and removable card table in the aft compartment of main cabin (top), with sleeping divans in the forward section (center). Modernistic desk (bottom) features writing leaf which folds under.

ITALIAN CONTRIBUTION is the Royal Gull amphibian, known in Italy as the Piaggio amphibian. Milwaukee's Kearney & Trecker Corp. has set up the Royal Aircraft Corp. to produce and sell the aircraft in the U.S. Two Lycoming 260-hp engines create a sea level speed of 180 mph with a seven hour range. Carries five. Price, between $65,000 and $70,000.

CONVAIR 340's are beginning to infiltrate the corporate fleets. Long, Parker & Associates of Dallas has achieved the height of luxury in the cabin (top) with space and dignity accented by lighting and furniture. Note curved lounge (bottom) topped by TV set and radio installed directly in the panelled wall.

PIONEER Air Line's suspension of Martin 2-0-2 service made available nine of the transports which William C. Wold Associates of New York is offering on lease-purchase plans. The Martin company leases one for its executive travel. Twenty-passenger capacity interior features two large hassocks (above) and complete galley facilities (left).

Gen. Demler Offers Some Solutions To the Noise Problem

- **The racket will get worse**
- **But the effect can be reduced**

MAJOR AIRCRAFT NOISE sources will not be significantly reduced within the foreseeable future, Brig. Gen. Marvin C. Demler, ARDC assistant deputy commander for technical operations, stated before a recent meeting of the Aircraft Luncheon Club in Washington.

"Rather the opposite can be expected," he said. Those noise sources affecting the community most directly are aircraft powerplants and the sonic boom resulting from supersonic flight."

More optimistically, these facts surrounding the air base noise problem were cited:

- Some reduction in noise levels associated with ground maintenance and ground operations can be expected.
- Community complaints about the noise levels from flight operations can frequently be reduced by changes in flight procedures.
- Successful community relations and public education offer the brightest hope for the immediate future.

The problem, he said, falls into three areas: The effect of excessive noise on persons at air bases; actual or imagined damage caused by aircraft noise; and the combination of the two which results in badly strained community relations.

He reviewed four often-discussed solutions as follows:

1. Reduction of noise at its source "does not appear very promising. . . . Unfortunately, as thrust increases so does the noise." He labeled as "hardly noticeable" such improvements as smoothing out the transition to afterburning and reducing rough burning. "There is even less we can do about . . . sonic boom," he observed, "except to restrict supersonic flight. Generation of the sonic boom appears inevitable. . . . Therefore, its control is a matter of careful flight planning, flight discipline, and plenty of altitude to avoid strong shock waves . . ."

He suggested that manufacturers might design the engine installation so that the power checks can be made in a minimum of time and preflight checks can be made while rolling on take-off rather than at the end of the runway.

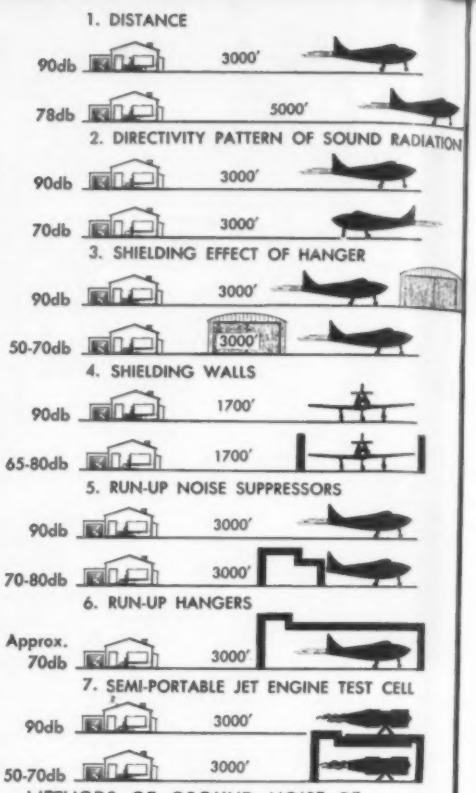
2. Suppression of noise during ground operations "offers more promise, although methods are expensive and cumbersome." He cited as a typical example the jet engine test stand noise reduction installation which "might cost $250,000. Even a simple blast wall for engine run-up costs between $30,000 and $60,000." Special walls for acoustic shielding have the advantage of lightweight material construction and they reduce jet noise by 20 or 25 decibels. But they have the disadvantage of having to be at least 40 feet high.

Run-up noise suppressors, Demler states, are "the most effective noise control for maintenance tests" providing 10 to 20 decibels of reduction, but disadvantages are size, weight, and cost, in both dollars ($25,000 to $60,000) and increased engine maintenance time. "For large multi-engine aircraft," he continued, "the trend is toward smaller movable mufflers for each engine pod. This was emphasized by the experience of Boeing in attempting to use a stationary suppressor built to accommodate all engines in a B-52—it took a whole day's work to get the airplane lined up properly with the muffler."

The maintenance run-up hangar, which would have to be concrete and large enough for the whole airplane, is being seriously considered for fixed bases "if the advantages can be proved to outweigh the disadvantage of relatively high cost." Another requirement is for a sound-treated, semi-portable engine test stand for minor overhauls. "Three different designs are now in the prototype stage," Demler revealed.

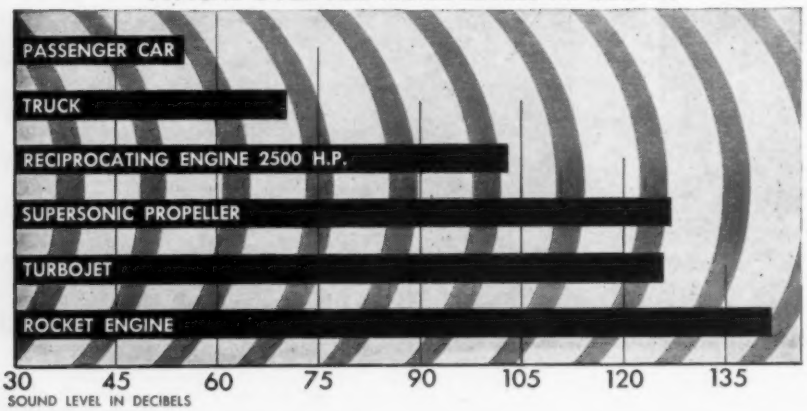
3. Control of flight operations "is a partial solution." He cited the preferential runway, locating over less populated areas, using crosswind landing capability, changes in climb procedures, enforcement of low-flying restrictions, and reduction of night operations in critical situations as examples.

4. Attention to community relations and public education "is believed by many to offer the best approach. . . . Experience has shown that a community which understands the problem and knows that all reasonable efforts are being made to control the noise nuisance," Demler concluded, "will adopt a cooperative spirit and an adaptive attitude. Without public understanding and good relations between the air base and the local community, individual and group reactions to aviation noises will vary from no annoyance to vigorous legal action." • • •



METHODS OF GROUND NOISE REDUCTION are shown in diagram above. Beside each of the eight problem solutions is shown the noise level reduction (in decibels).

TYPICAL OVER-ALL NOISE LEVELS AT 300 FT.



A BUILDING BOOM TAKES OVER IDLEWILD

Not only are new hangars going up fast, but industry is eyeing the big airport.

BY WILLIAM D. PERREAULT

FIRST OF ITS KIND is this new $4 million hangar of Lockheed Aircraft Service-International at Idlewild. Note unique cantilever roof structure giving large unobstructed areas.

THE AVIATION industry's building program at New York International Airport (Idlewild) is progressing almost as rapidly as the growth in the airport's plane and passenger movements. Highlighting this progress was the recent completion of Greer Hydraulics' new $1.3 million production plant on the airport almost simultaneously with dedication of Lockheed Aircraft Service—International's $4 million maintenance and overhaul facility.

Greer's facility is of major significance to the development of Idlewild because it is the first wholly industrial building to be built there. If Port of New York Authority officials have their way it is only a beginning. The PNYA has set up a Real Estate Div., formerly the Land Development Div., which has as its main purpose the development of general industrial buildings on the fringes of the 5070-acre airport.

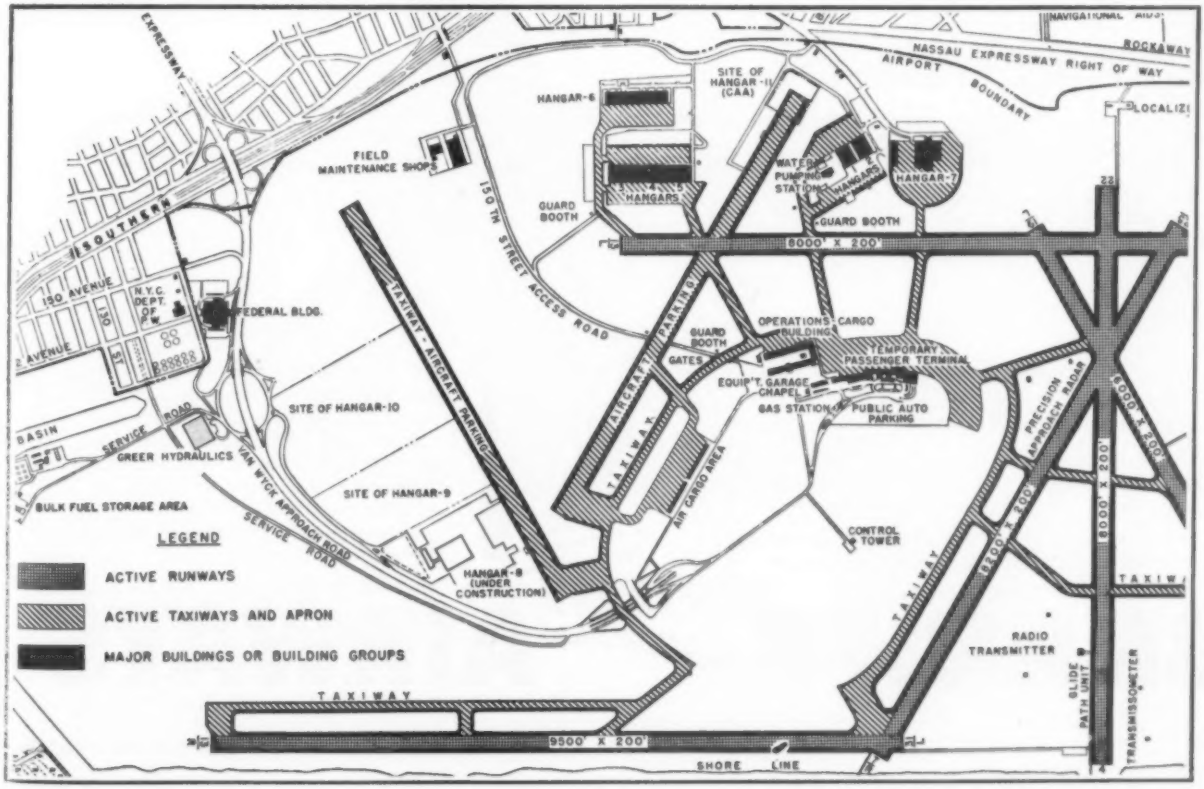
Lockheed's new facility, which gives the Lockheed Aircraft Corp. subsidiary a major expansion from its earlier quarters on Idlewild, is another link in the rapidly mounting number of hangars for service work. It is the first such hangar built specifically for a commercial overhaul facility.

The first large suspended cantilever hangar in the world (see photo), Lockheed's facility is Hangar No. 7. A $5 million hangar is now under way for United Air Lines (Hangar 8), and design of a $4.5 million installation for Eastern Air Lines has been completed and contracts are being prepared (Hangar 9).

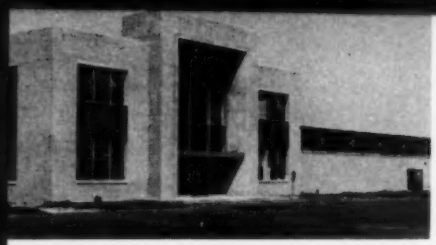
Hangar 10 represents another significant development at Idlewild. It is American Airlines' $8 million project on a 156-acre site. Unlike the other hangars and buildings at Idlewild, built by the PNYA to designs approved by the lessee, American will design and contract for construction of its own hangar. It has simply leased the land from the PNYA.

The other new home owners on the airport—National, Greer, Lockheed, etc.—pay a fixed sum which covers land rental and amortization of the facility. They have 20-year contracts which provide an option for renewal for shorter

MUSHROOMING maintenance, overhaul, and manufacturing facilities at Idlewild, and some idea of the space still available on the 5070-acre airport, are shown on this plan view.



HIGH



Greer's new $1.3 million home provides the company a modern industrial installation in which to consolidate its previously scattered divisions.

periods if the tenant cares to pick it up. Under this arrangement the tenant gets a fully completed installation into which he can move with a minimum of effort.

American's contract will leave many of these provisions up to AA. The PNYA provides taxiways to the edge of the property as well as plumbing, electrical power, etc. The airline will handle the utilities from the boundary to the point of use and will also provide apron areas and similar facilities.

CAA has space, too

CAA will have Hangar 11 for use as the area's Air Traffic Control Center and for other CAA communications functions. This is a $1.5 million set-up.

Contracts between the Port Authority and other airlines, notably TWA and Pan American, are in advanced stages of negotiation. No information is available as to the nature of these contracts—whether they fit the American pattern or that of earlier installations.

No moves from LaGuardia

A significant point is that none of the airlines with new facilities or contracts for new ones, has indicated to date that it will vacate the LaGuardia Field hangars. American, for instance, has three regular hangars plus a comparable engine overhaul facility at LaGuardia.

The LaGuardia Field hangars are so small compared with the new hangars that they apparently present no problem. Lockheed Aircraft Service-International's new set-up provides 138,000 square feet of hangar space including 48,000 square feet for shops and warehousing. A second floor offers 28,000 square feet of administrative office areas.

Transposed to aircraft terms, the LASI hangar will handle seven Lockheed Super Constellations simultaneously while the 11 acres of paved ramp surrounding the hangars make room for 15 more four-engine aircraft. The suspended cantilever design gives LASI unparalleled unobstructed area with one section 400 x 133 feet and the other 270 x 133 feet. The layout is divided into five bays, each with 32-foot vertical clearance. A 101- x 443-foot section houses both shops and offices.

Greer Hydraulics, which grossed over $12 million last year, has its complete research, development, and production facilities under one roof for the first time in recent years. Prior to moving into the facility in July, Greer was spread out in four buildings in Brooklyn. The $1.5 million plant is being stocked with another one-half million dollars in new machine tools. It is built on a 10-acre site, but the company holds an option on another five acres for long-range expansion.

10 airlines have space

The original five hangars on Idlewild, two built by New York City and three by the PNYA, are very much filled up with 10 airlines sharing their use. KLM, Seaboard & Western, and El Al Israel Airlines share Hangar 1, Scandinavian Airlines System, Air France, and LAV share Hangar 2, BOAC and PAA share Hangar 3, PAA and Northwest Airlines share Hangar 4, and TWA has No. 5. • • •

HIGH

Relax in air-conditioned comfort . . . as you fly above the weather in Northwest's double-deck Stratocruiser, world's most luxurious airliner.

WIDE

Stretch out all you like in the wide, soft seats... enjoy a delicious complimentary meal . . . or stroll around the spacious Stratocruiser cabin.

AND HANDSOME

Enjoy your favorite beverage in the lower-deck club lounge. Only Northwest gives you Stratocruisers Coast to Coast, Alaska and the Orient.

NORTHWEST *Orient* AIRLINES

Rand study concludes . . .

TURBOPROP COSTS ARE LOWER

WITH THE DOUGLAS C-132 turboprop cargo transport still considered the front-runner in the race for the USAF's nod for an aerial logistics system vehicle, first details of the heretofore classified Rand Corporation study which recommended such an airplane for this role have been disclosed.

Addressing a recent Society of Automotive Engineers' session in Los Angeles, T. V. Jones, former Rand aircraft design analyst and now deputy chief engineer for Northrop Aircraft, Inc., confirmed this major conclusion of the Rand study:

• Aircraft powered by turboprop engines provide lower direct operating costs than either turbocompound reciprocating engines or straight jet engines for any combination of design, payload, and range considered.

Of the aircraft studied by Rand, Jones listed these varying design-point characteristics considered in one or more of the transports:

Payload—25,000 to 150,000 pounds at several cargo densities.

Range—1500 to 3500 nautical miles.

Cruising Speed—180 to 490 knots.

Required Field Length—2000 to 6000 feet.

The largest aircraft mentioned by Jones in the transportation job analysis approached the estimated dimensions and performance of the Douglas C-132. Operating at a gross weight of 406,000 pounds, this turboprop would carry a 100,000-pound payload at a cruising speed of 430 knots (495 mph) over a 3500-mile range.

Complete list of aircraft studied by Rand included:

Airplane	Engine	T. O. Weight (Lbs.)	Cruising Speed (Kn.)	Design-Point Payload (Lbs.)	Design-Point Range (Naut.)
A	Turboprop	82,000	345	25,000	1500
B	Turboprop	172,000	345	50,000	3500
C	Turboprop	325,000	345	100,000	3500
D	Turboprop	406,000	430	100,000	3500
E	Turbojet	288,000	430	50,000	3500
C-54G	Piston	69,000	162	13,750	1924
C-124A	Piston	175,000	179	40,615	1917

Assuming a theoretical timetable of cargo movements daily over a sample route system with stage lengths ranging from 1500 miles up to 4500 miles, Jones showed these fleet operating characteristics for the aircraft analyzed:

Airplane	Cruising Speed (Kn.)	Fleet Size	Avg. Cargo Load Factor	Direct Oper. Cost per Day	Fuel Cons. Gals./Day
A	345	57	.895	$100,220	236,000
B	345	21	.800	56,440	127,000
C	345	12	.735	54,550	126,500
D	430	9	.704	66,702	176,000
E	430	14	.776	90,610	248,000
C-54	162	171	.890	244,000	342,000
C-124A	179	58	.780	160,000	236,000

Praise to New Castle

Civil Aeronautics Administration tower control operators at the New Castle County Airport, Del., have been praised by the Delaware Air National Guard for running "the most courteous, safe, and efficient control tower operation" that the military fliers have ever encountered.

The 10-man staff received certificates from Delaware's Gov. J. Caleb Boggs citing their performance. Col. William W. Spruance, chief of staff for air in the ANG, noted that "We took the tower for granted until our first summer camp away from New Castle. The unanimous reaction of our pilots [then] was that someone was going to get killed due to faulty tower control."

MATS to Test Turboprops

Military Air Transport Service will set up a special squadron at Kelly AFB, Tex., to service test six turboprop transports and has invited the major airlines to participate.

The Service Test Squadron (Turboprop) Provision, under command of MATS Continuental Division's 1700th Air Transport Group, will fly two Convair YC-131C's (two Allison 3750-hp T56's each), two Boeing YC-97J's (four P&W 5700-hp T34's each), and two Lockheed YC-121F's (four T34's each) on cargo operations for experience.

Airline Commentary

By Eric Bramley

MOST talked-about subject these days among sales personnel is the possibility of a "reservations charge." National Airlines has been considering such a charge for months. Plan would work something like this: A passenger requesting a reservation is given a time limit within which to pick up his ticket. When he buys it, a percentage of total cost (say 10%) is a non-refundable, non-transferable reservations charge, assuring him of a definite seat. If he cancels, no-shows, or changes to another flight, the 10% is forfeited. Thus, on a $20 ticket, $18 is transportation, $2 is reservations charge. However, if you want to take your chances as a "go-show," without a reservation, you pay only $18. Many believe this would lick the no-show problem. There are, however, many points that must be worked out: Arrangements with travel agents for collecting the charge, what to do about interline connections, would the basic fare be raised, etc. It's a hot item about which more will be heard.

• •

Penalty system on air coach hasn't been very effective in cutting no-shows, we're told. Rumor is that one carrier may urge that the rule be rescinded.

• •

Watch the growing industry trend toward trying to take business away from the private automobile. Air coach, of course, is the selling point. Trend is becoming more and more evident in advertising and promotion. Typical is the comment of Walt Johnson, American's v. p.-sales manager, who noted recently that probably 85% of all U. S. travel is done by auto. "You can see from that figure," he added, "that therein lies the long-range growth and development for American and the other airlines. That's one of the areas on which we're going to spend a lot of time."

• •

Around the industry: It's likely that airlines will overhaul and simplify public address announcements . . . Carriers are being cautioned, through Air Traffic Conference ticketing and baggage subcommittee, to make certain that "no tipping" signs are posted in all baggage areas. Limo operators are also being asked to display signs in vehicles.

Sales, Traffic, Promotion

United Air Lines is now serving a cocktail with dinner on its non-stop Seattle-Los Angeles flight. The drink, which was added when equipment changed from Stratocruisers to DC-7's, is served southbound only—4:30 p. m. departure. (Northbound leaves at 9 a. m. Also, California has no law providing liquor licenses for airlines flying over the state.) This is the first liquor service on a coast run except for champagne which Western serves with meals on DC-6B's. UAL also serves champagne with dinner on one LA-San Francisco schedule in each direction . . .

Recent survey results: First two months' sales under TWA's "time-pay" plan show that white-collar workers accounted for 25% of total, employed women and skilled laborers each accounted for 22%. Thirty percent of customers had incomes of $350 to $500 monthly, 25% were in $250-$350 class . . . **Over 30%** of Northwest Airlines' tourist passengers (system-wide) are women. Military travel constitutes 22% of NWA's domestic tourist business; "first-riders" are 16% domestic, 14% international . . .

Matt Kramer, territorial sales manager for Continental Air Lines, has patented a plastic "Kramer-Kup." Removable lid slides over cup's contents through a slot near the top leaving a small half-moon opening for drinking. Kramer thinks it'll be a boon for air travelers . . . **CAL has installed** automatic telephone-answering equipment at Houston, San Antonio, Tulsa, and Lawton, and will probably enlarge the program to include many other cities . . .

British Overseas Airways Corp. has introduced a "budget" plan under which passengers from continental U. S. can buy tickets for 10% down payment, 20 months to pay . . .

TWA and Continental plan a cooperative advertising and sales promotion campaign to increase winter tourist business to Colorado . . . **For the seventh** consecutive year, Capital Airlines has been cited by Direct Mail Advertising Committee of America for excellence in its direct mail program . . .

American Airlines has revived its "Customer is King" theme used so effectively several years ago to promote improved passenger service . . . **AA is now giving** "junior pilot" and "junior stewardess" rings and certificates to child passengers . . .

Congratulations to Trans-Canada Air Lines on its useful folder, "How to make connections in New York." Contains a map and all pertinent information on airlines bus and helicopter service in New York area . . . **Also,** congrats to Bob Phinney, Braniff's agency and interline sales manager, on his interline bulletin, "Sellerator." Humorous, readable, and informative . . .

First direct air service California-Brazil was started Nov. 1 by Pan American World Airways. One of PAA's three-weekly DC-6 flights (a tourist trip) between Los Angeles and Panama was extended to Caracas, Belem, Rio de Janeiro, and Sao Paulo. Los Angeles-Rio flying time is 26½ hrs. The 7000-mile Los Angeles-Sao Paulo flight is the longest in the Latin American Division . . .

A Z-circuit, teletype system to speed interline reservations, has been opened in Los Angeles. It's the fourth in the U. S.; other three are in Chicago, New York, and Detroit . . .

Stretcher service is now available on TWA's domestic first-class Connie flights . . . TWA has extended sell-and-report procedures to three more overseas offices—Cairo, Athens, and Copenhagen . . .

Comes a note from Warren Kramer, v.p.-traffic and sales of Scandinavian Airlines System in New York, regarding Delta-C&S' statement (Oct. 11 issue) that it is producing the first three-color airline timetable. "SAS has produced a four-color schedule folder for the last two and one-half years, and we're prepared to take the risk of saying that we believe that SAS scored a first in this respect in the U.S.," Warren says . . .

United Will Install "Unitel" In Spring

Second airline to install automatic reservations equipment will be United Air Lines. By next spring "Unitel" will be in operation at New York, Chicago, Los Angeles, and San Francisco, and subsequent expansions may include all cities on the system.

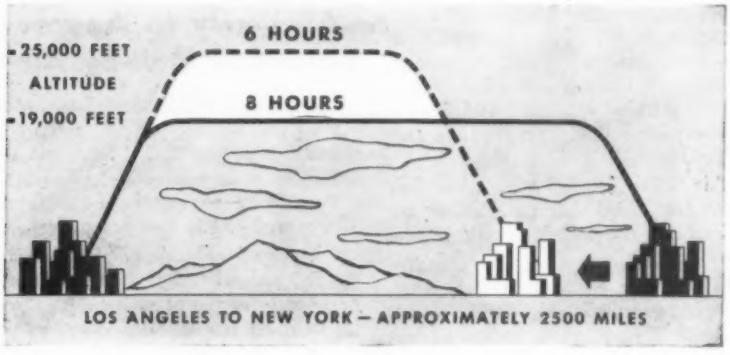
Unitel, to be built by Teleregister Corp., will be similar to American Airlines' Reservisor. Master space control machines in New York will be located in UAL's reservations center at East Side Airlines Terminal. Remote sets, resembling desk-size adding machines for operation by sales agents, will be used at the reservations center and 11 sales offices in the greater New York area.


TOMORROW'S AIRCRAFT: One step closer
Jet pods give aircraft new speed and range ...greater utility

Westinghouse J34's—podded and slung under the wings—give the U. S. Navy "Neptune" extra speed and reduce the take-off run. On missions, they can give the extra margin of power to get on target faster and away quicker. Drag is less and performance even better than anticipated.

The record of the J34 shows it well fitted for such auxiliary use. It has been proved in tough operational service; has advanced to a 720-hour overhaul life; performed up to 56,000 feet; withstood severe battle damage; and is quick to install and easy to maintain. The J34 history shows progressive design changes and performance improvements to its present highly developed state giving the best specific fuel and weight characteristics available in its class.

Westinghouse aviation engineers are ready to give you a wealth of information on the use of J34's to achieve extra speed, range, and endurance for both military and commercial operational requirements—a ready-made opportunity to bring tomorrow's aircraft . . . One Step Closer. Westinghouse Electric Corporation, Aviation Gas Turbine Division, P. O. Box 288, Kansas City, Missouri. J-91017



Tomorrow's Aircraft Brings Cities One Step Closer. The dotted line shows how J34 pods can help aircraft reach optimum altitude faster, maintain more efficient cruise control, and retain extra margins of economy in time and distance. En route time can be drastically reduced; as, for example, the Los Angeles to New York run which might be cut as much as 25%. J34 auxiliaries can give these advantages to aircraft currently in use or planned for future requirements.

Jet Propulsion • Aircraft Electrical Systems and Motors • Airborne Electronics • Wind Tunnels to Plastics

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Westinghouse

CAB News

By William V. Henzey

75% Rule May Apply to All Schedules

CAB's new 75% rule, adopted as a measure of realism for transcontinental non-stop schedules, may be applied to schedules of all U. S. carriers. Currently, American, TWA, and United, are involved in talks with CAB's compliance office over their transcontinental schedules.

But a cross-section view of the entire schedule picture appears necessary to assure non-discriminatory application of the new CAB test.

Generally, it is CAB's idea that a published airline schedule should be made at least 75% of the time. If schedules are less reliable than that, they would be considered "unrealistic" and the carrier publishing then requested by CAB to change or to face an enforcement action.

From the airline standpoint, there is, at this time, no agreement with CAB on the 75% rule. The three big airlines now involved in the transcontinental fight may eventually test the rule legally if they decide not to adjust their schedules.

Specifically at issue at this point are eastbound flights Los Angeles-New York, scheduled for 7 hours, 15 minutes by American, United, and TWA. Westbound non-stops of United and TWA, scheduled for 7 hrs., 55 mins., are also involved.

Air Line Pilots Association has protested to CAB that the carriers are not making the schedules within the 75% rule.

The entire issue is an outgrowth the eight-hour flight rule dispute which led to a 25-day pilots strike against American in August. The company originally published its westbound DC-7 nonstop schedules as 7 hrs., 55 mins. ALPA, of course, protested when the flights were not being made in that time.

TWA and United, competing with AA in the transcontinental non-stop market, also published the 7 hrs., 55 min. schedule but have not increased the time because contracts with their flight crews contain an eight-hour clause.

Objections Have Stalled CAB's Mail Rate Plan

Objections to CAB's new multi-element mail rate structure by United Air Lines, which stands to lose $1.3 million annually under it, have stalled CAB's attempt to effect the structure on a temporary basis.

The new structure, which contemplates an average industry ton-mile rate of 41.46¢, as contrasted to the present 45¢-and-up rates, was originally proposed by CAB on a permanent basis for the domestic trunk carriers. United was first to object to that proposal, followed by TWA, Post Office, and Slick.

Subsequently, CAB proposed to effect the structure on a temporary basis pending hearings on a final permanent rate. United again objected.

The new structure would cut the PO's annual service mail pay bill by over $3 million. Instead of the present "single rate" method, it involves a "line-haul" rate of 30.10¢ per ton-mile for all carriers, with additional "terminal" charges to be added. The terminal charges vary with the size of the cities served.

CAB Likely to Approve Expanded Mail-by-Air

Expansion of the first-class-mail-by-air experiment to include service between Seattle and San Diego appeared imminent at presstime as CAB weighed a Post Office request for establishment of a special 18.98¢ rate per ton-mile.

Opposed only by railroad interests, the PO request differs from present experiments in that it contemplates service to small intermediate towns as well as major terminals.

Route involved would be between Seattle, Portland, Salem, Bend-Redmond, Eugene, Medford, Klamath Falls, San Francisco, Oakland, Sacramento, Stockton, Modesto, Merced, Salinas, Fresno, Visalia, Bakersfield, Los Angeles, and San Diego.

Airlines which would participate are United over the entire route, Western between all major points on the route, TWA between Los Angeles and San Francisco, and Northwest between Seattle and Portland. All have indicated formally or informally that they would accept the proposed PO rate.

PO estimates that 3,486,000 ton-miles of mail are available and that approximate airline revenue from the experiment will be $661,530 annually.

As of Now

Briefs were filed late last month in CAB's **Large Irregular Air Carrier Investigation** paving the way for an examiners' report possibly in December. A final Board decision on the public interest phase of the case should be out in early spring, 1955. If the Board finds there is a place for non-scheduled lines, it will then hear individual applicants on the basis of their fitness to operate.

Hearings in the **Additional Northeast-Southwest Service Case**, the biggest route case in years, are still in progress and will continue throughout the year.

CAB's decision in the **Trans-Pacific Renewal Case** was slated to go to the White House late last month while its decision in the **New York-Balboa Case** had a post-election date label.

First procedural step in the **Eastern-Colonial Control Investigation** was taken early this month with a prehearing conference in Washington. Meanwhile, Colonial has postponed until December 20, its deadline for merger bids.

Recent CAB Decisions

Northeast, Atlas, Convair, et al. enforcement proceeding over sale of Convair 340's to foreign line, dismissed in view of stipulation signed by parties and CAB's compliance office.

Braniff-TWA interchange agreement for one daily flight between Houston and West Coast approved pending CAB's hearings on proposed unlimited service.

Northeast Airlines is authorized to serve Newport, Vt. between June 15 and September 15 for next two years.

Resort Airlines authorized to suspend winter service at Havana and Varadero, Cuba, Washington, D. C., and Nassau, Bahamas.

CAB Calendar

Nov. 8—Hearings, Commercial Charter Resolutions Case (IMATA & ACTA). Washington, D. C. Docket 6580.

Nov. 8—Hearings, New York-Mexico City Nonstop Case. Washington, D. C. Docket 2909 et al.

Nov. 15—Hearings, Trans-Texas Airways Control Case. Washington, D. C. Docket 5993.

Nov. 15—Prehearing conference, Helicopter Air Service Renewal Case. Washington, D. C. Docket 6600.

Nov. 22—Hearing, Norfolk-Atlanta Nonstop Investigation. Washington, D. C. Docket 6647 et al.

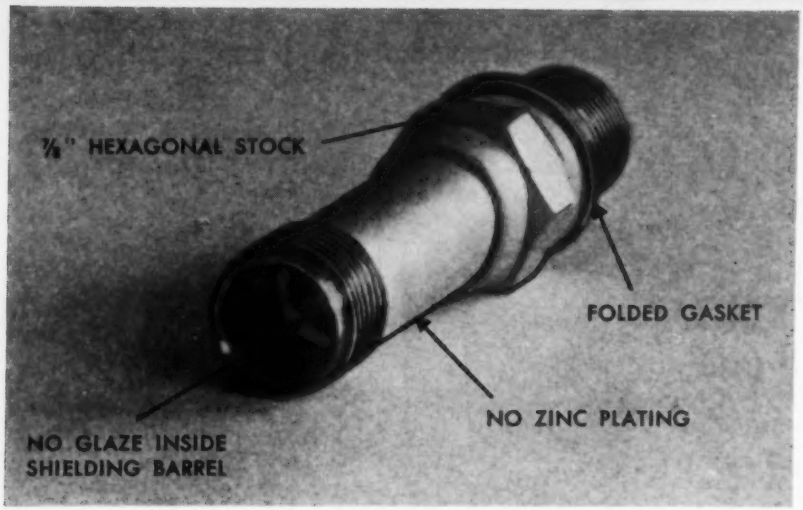
Nov. 22—Hearing, PAA-Lineas Costarricences Acquisition Case. Washington, D. C. Docket 6594.

Nov. 29—Hearing, Reopened Western-Inland Mail Rate Case. Washington, D. C. Docket 2870 et al.

CAB Applications

Panagra pilots have protested reopening of the record in the New York-Balboa Case requested by Pan American pilots in dispute over PAA-Panagra Through Flight Agreement.

Allegheny Airlines wants CAB to consolidate into one investigation all cases dealing with renewal, acquisition, and/or dismemberment of Lake Central Airlines.



Here are some features of the new plug which save money.

"De-glamorized" Spark Plug Is Big News At Champion Conference

A SIMPLIFIED, low-cost spark plug which sacrifices nothing in performance has been offered to the industry by the Champion Spark Plug Co.

Innovations in its manufacture include the use of ⅞" hexagonal stock instead of one inch round, high temperature aluminum paint instead of zinc plating on the outside of the shell, a folded copper gasket instead of a solid one, and the elimination of glaze inside the shielding barrel. In military plugs, adoption of a gap setting of 0.015" Go and 0.019" No-Go is also expected to help cut costs by cutting rejects.

The plug, referred to by Champion as "de-glamorized" and by others as "one-run" or "throw-away" is not yet in sufficient production to provide final cost figures. Estimates indicate that the folded gasket alone will save $3500 on each million plugs, due to reduction in scrap, and that 50 tons of steel on one million plugs will be saved by use of the ⅞" stock. At $150 per ton, this amounts to a saving of $7500.

The round table discussions

Report on the plug's progress was one of the highlights of the 10th annual ignition conference held recently by Champion in Toledo, O. The three-day roundtable discussions drew an audience of close to 150, with the military services and the host company best represented, and other manufacturers and the airlines close behind.

A paper describing basic physical reactions in various types of ignition, by J. G. Sharp, of the Shell Petroleum Co., Ltd., England, opened the conference, and the results of a chemical analysis of spark plug deposits were described next day by Dr. Frances Lamb of the Ethyl Corp. X-ray diffraction had been used in investigations of several hundred plugs, from which an extensive library of identified lead salts was built up by the oil company.

Lead fouling was in the spotlight throughout the meeting. The consensus was that the trend was slightly downward. United Air Lines reported that the Pratt & Whitney R-2800 fouling situation has been improving over the last two years, but that the problem is still demanding attention on the Wright R-3350. Spark plug fouling on take-off, reported UAL, has definitely been improved.

On cold-weather operation Trans-Canada Air Lines found that close control of charge temperatures was the secret of reduction of lead fouling with the Rolls-Royce Merlin engine. A difference of only five degrees, said TCA, was highly significant.

For North Central Airlines the answer to fouling in winter operations proved to be a modified airscoop, directing a blast of cold air on the aneroids, with carburetor heat used on the ramp until time for the actual take-off. "Since we adopted this," said George E. Roycraft, NCA assistant superintendent of maintenance, "we have almost eliminated problems of this nature."

On ground fouling of plugs the Wright Aeronautical Division of Curtiss-Wright suggested that the idle mixture be carefully set and that the engine be run at 2200 rpm for one minute for each 15 minutes of ground operation, or until the cylinder heads reached 250°, whichever came first. This is designed to provide spark plug core nose temperatures in the vicinity of 1000°.

What about TCP?

American Airlines added that during ground operations it brings engine power up to magneto checkpoint once every hour to burn out deposits. United, on its R-2800's and R-3350's, uses 15-second operations at eight inches above barometric pressure in autorich for the same purpose. Considerable fouling on take-off has been experienced with the DC-7, reported UAL, after a normal amount of previous ground running. At intermediate stops, however, there has not been trouble to the same extent.

The effect of TCP is such that it is unsuitable for the Wright Turbo-Compound, declared Wright Aeronautical's L. C. Smith. Over 100 hours of testing revealed build-ups of deposits in the turbine recovery system sufficient

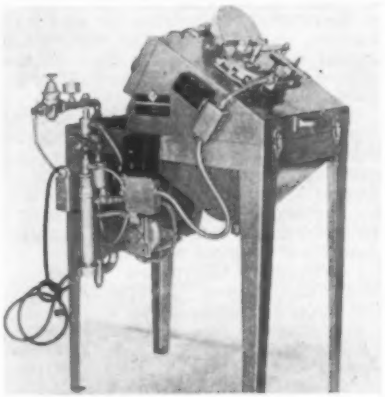
Important Spark Plug Developments of the Year

Among other things, airline and military spark plug users attending the Champion conference were pleased with: Performance of the ¾"-20 all-weather plug; the 0.015"-0.018" gap in the R-2800; the longer life due to use of the R56S plug in the R-2800 (Pan Am went from 150 hours with the R37S-1 to 300 hours); the new cement, which Champion put into production four months ago, designed to end cases of loose barrel insulators in the R37S-1; the 45° piece which Champion has taken off a nylon washer in the ⅜"-24 plug, to prevent interference with entry and removal of the terminal sleeve.

Other manufacturing developments during the year: The R111 went into production in December, 1953; color coding began to denote heat ranges of plug types (R111, lavender; R115, aluminum; R103, black). In research and development, Champion cited efforts directed toward resistors with higher ohmic resistance; emphasis on corrosion rather than erosion in the future; and investigations of the effect of lead deposits, rather than their chemical composition.

to fill in some of the clearances between the turbine wheel and stationary points. Heaviest deposits showed up on the cooling shield flange ring. Blades of the recovery turbine wheel also had contours altered; effect was next most serious on the nozzles.

The Shell Oil Co. reported that Wright Field had also run a TCP test with identical results. The turbine wheel could not be spun by hand as a result of the deposits. Wright Field, however, according to Shell, has approved the



Vapor Blast spark plug cleaner can clean 200 plugs an hour.

use of TCP up to 50 hours, provided that it is followed by one or two loads of regular fuel and an inspection of the turbine.

"We still believe," added Shell, "that TCP does an effective job of preventing spark plug fouling, where the problem is present." Pratt & Whitney's Al Yacovone noted that the presence of tetraethyl lead in fuel was conducive to difficulties, adding "We have seen no evidence of TCP harm to the engine; this, of course, does not apply to the exhaust system. Unless we can reduce the concentration of TEL, we are either going to have to adopt new techniques or use TCP."

TCP's carry-over effect

The USAF reported that some aircraft, when switched from TCP to ordinary fuel, continued to remain free of spark plug fouling for some time. One unit based on Guam went 60 days after going off TCP without trouble from fouling. Shell replied that some carry-over effect could normally be expected, but that this should be in the neighborhood of five or six hours.

The fact that the USAF has been relatively free from exhaust system deposits, said Shell, was due to the use of spark advance and manual leaning, both of which help cool exhaust gases.

The Vapor Blast spark plug cleaner was on display during the meeting. Two of the machines are now in use by Western Air Lines at Los Angeles and one has been installed by TWA at LaGuardia, according to Vapor Blast's A. P. Neumann. The device cleans two plugs simultaneously in 30 seconds, in automatic operation. Cleaner is 200-mesh powdered honing stone.

Reported TWA's John Morelli: "It apparently takes all the deposits out, and cleaning material does not pack in." TWA has used it on R103 and R37S plugs, but not on any fine-wire models as yet. Swab and acetone complete the cleaning.

In jet igniters, the ignition record is colored by the relatively short life of the engines involved: 50 hours average for fighters, 350 for bombers, though some last much longer, according to a representative of Tinker AFB, Okla. One problem in fighter engines has been porcelain breaking from insulator tips and striking turbine buckets. Reese AFB, Lubbock, Texas, reported only 42 igniter failures during the past year, all from cracked insulators, which it considered a good record.

Among main jet igniter problems: Burning of the shell; heat shock (causing the ceramic breakage cited above); seizure of coupling nuts; barrel warpage. Continuing trend toward surface discharge rather than high-tension plugs was predicted. • • •

People

David S. Smith has moved from Special Assistant to the Under Secretary of State for Administration to Assistant Secretary of the Air Force for Manpower and Personnel. Responsibilities extend to manpower, personnel, reserve, ROTC, and National Guard matters.

Other top personnel changes recently made include:

Manufacturing

Lawrence A. Hyland, from v.p. in charge of engineering for Bendix Aviation Corp. to v.p. and gen. mgr. of Hughes Aircraft Co.

Frank L. Bailey, from sales engineer for Hi-Shear Rivet Tool Co. to sales mgr. of Chem-Mill Division, Turco Products, Inc.

Guy Miller, former president and general manager of Wings, Inc. (Wings Field, Ambler, Pa.), named special assistant to commercial sales manager for Beech Aircraft Corp.

L. R. "Mike" Hackney, former head of Lockheed Aircraft Corp.'s air cargo activities and until October 15 executive vice president of Transport Air Group, is now administrative ass't to W. L. Landers, general manager, Aircraft Div. of Fairchild Engine and Airplane Corp., where he will have responsibilities related to civil and military air freight developments.

Christopher Clarkson, former civil air attache at the British Embassy in Washington, named representative of Vickers-Armstrongs, Ltd., in the U. S., with offices at 10 Rockefeller Plaza, New York City.

Smith

Clarkson

Hackney

Miller

Bernard L. Whelan, gen. mgr. of Sikorsky Aircraft Div., elected a v. p. of United Aircraft Corp., the parent organization.

James D. Redding, previously with the Assistant Secretary of Defense for Research and Development where he directed the committee studying aeronautical facilities, appointed to the Aviation Gas Turbine Div. of Westinghouse Electric Corp. in Kansas City.

Lawrence D. Bell, president and gen. mgr. of Bell Aircraft Corp. since its founding in 1935, has relinquished his duties as gen. mgr. to devote full time to the presidency. **Leston P. Faneuf,** former ass't gen. mgr., secretary, and treasurer, moves up to gen. mgr. and treasurer, and **William G. Gisel,** comptroller, becomes secretary and comptroller.

Donald S. B. Waters, former financial ass't to v.p. and gen. mgr. of Kaiser Metal Products, Inc., elected president and director of Doman Helicopters, Inc. **Glidden S. Doman,** former president, continues as chairman of the board and, in addition, serves as v.p.-engineering.

Otto E. Kirchner, former director of operational engineering for American Airlines, named to conduct commercial aircraft studies as a member of the engineering staff of Boeing Airplane Co.

C. D. Perrine, Jr. named director of engineering of Bendix Aviation Corp's Pacific Div., from chief engineer and ass't div. mgr. of Consolidated-Vultee Aircraft's Pomona Div. **James P. Buckley,** former ass't gen. sales mgr. of the Eclipse-Pioneer Div., named Bendix's west coast regional sales mgr.

William P. Carpenter named installation engineer of Pesco Products Div., Borg-Warner Corp.

Promotions in the Georgia Div. of Lockheed Aircraft Corp.: **R. J. Sorenson** to staff engineer in charge of electrical and electronic work; **J. E. York** to mgr. of the structural dept.; **H. O. Davis** to ass't project engineer on the C-130A turboprop cargo airplane; **E. R. Burn** to ass't B-47 project engineer.

Alfred A. Gassner retained to head Fairchild Engine and Airplane Corp.'s Kinetics Division which was created last month when Fairchild absorbed Gassner Engineering, a consulting group.

Laddie L. Stahl appointed mgr. of product planning for General Electric Co.'s Guided Missiles Dept.

Harry D. Edmiston, named purchasing agent for Camair, Aviation Division of Cameron Iron Works.

Airlines

Nowell D. Jones, previously Qantas Empire Airways' mgr. in Japan, transferred to New York as special representative, East Coast, North America.

R. Glenn Archey appointed interline sales mgr., and **W. G. Cook** named special military sales representative, for Central Airlines.

At United Air Lines' Denver Operating Base: **F. A. Brown** to ass't to v.p.-transportation services; **Peter Burfening** to ass't to gen. mgr. of passenger service; **D. S. Fowler** to admin. ass't-personnel management for ground services; **D. G. MacDonald** to performance and controls mgr.-transportation services; **S. R. Wallace** to facility planning manager-transportation services; **R. F. Dorsey** and **H. W. Furman** to mgrs.-station operations.

Henry Kammler named international tour mgr. for KLM Royal Dutch Airlines in the U. S.

Dr. George P. Baker, former CAB member and now professor of Transportation at the Harvard Graduate School of Business Administration, elected president of the Transportation Association of America. He will succeed Frank C. Rathje whose term expires December 1.

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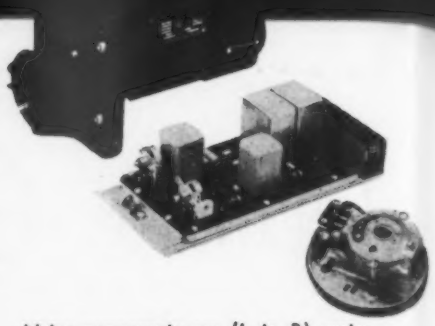
Here's A New Directional Stabilizer



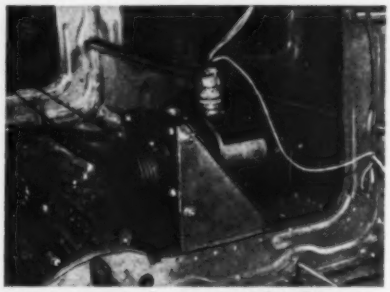
Major components are (L to R) motor-driven servo actuator, amplifier, rate gyro.

IN A MAJOR advance toward making the "graveyard spiral" a thing of the past in small- and medium-plane bad-weather flying, Lear, Inc. LearCal Division this month went into production with its new Arcon directional stabilizer system. Its simple role is to keep the airplane in straight-line flight and to prevent the fatal spiral dive that has become a major cause of accidents in the clean, fast group of small aircraft.

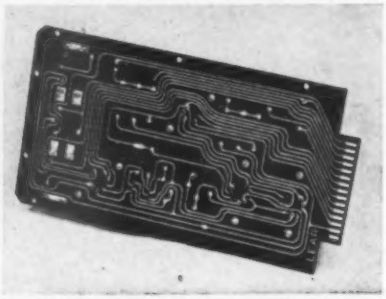
Major components of the 12-pound Arcon system are a rate gyro, usually installed on the main wing spar, an amplifier, and a servo unit coupled to the rudder controls. In operation, tendency of the airplane in free flight to turn is sensed by the gyro, "measured," and signaled through the amplifier to the servo where the needed correction is applied to the rudder control cable.

Big advantage of the Arcon design, Lear says, is that it is a proportional type wherein the amount of correction applied is exactly that needed to cancel out the tendency to turn. Explanation is that this gives a much smoother operation than the "stop-and-go" type of unit which turns on and off in operation, tends to overcontrol, and then must reverse itself.

Basically, Arcon is engineered to be "installed and forgotten." Should trouble develop, however, the servo can be removed for service without disturbing the rudder control rigging. The airplane can be flown without Arcon. Magnetic amplifiers are used instead of vacuum tubes for long-life reliability,



Arcon servo is shown mounted in Bonanza connected to rudder control system.



Etched circuitry on Arcon amplifier baseplate replaces internal wiring—eliminates loose connections.

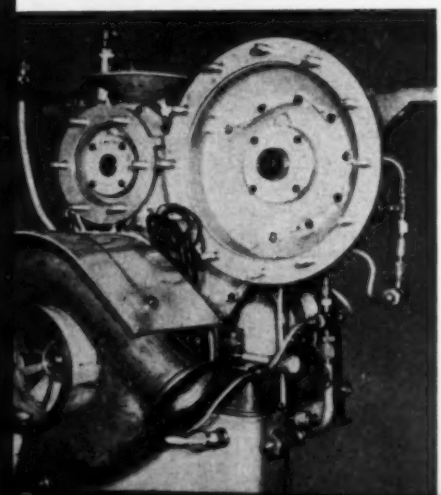
and etched circuitry replaces all internal wiring to dispense with the problem of wire breakage.

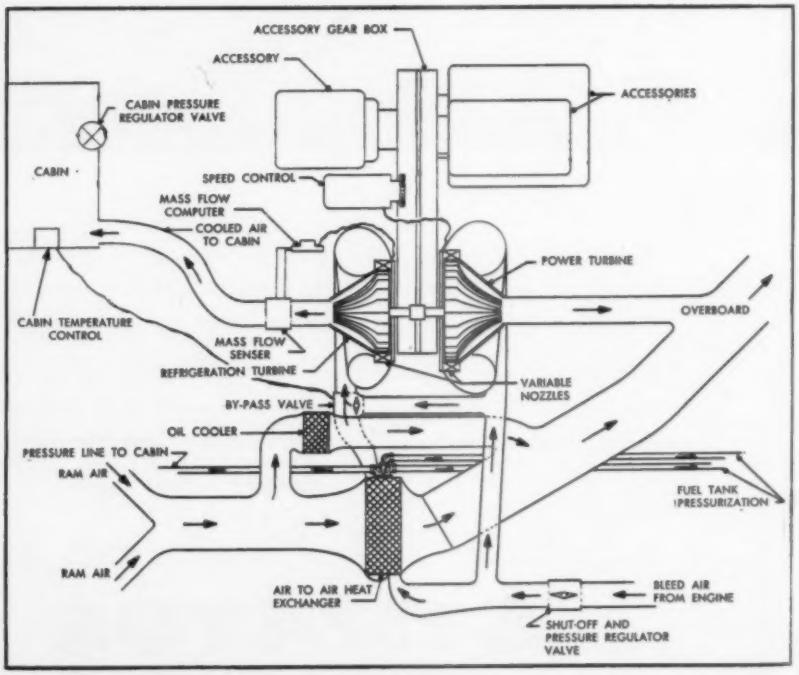
New Air Conditioner - Accessory Drive

HYDRO-AIRE, Inc. of Burbank, Calif. has announced development of Frijadrive—a compact twin-turbine system for jet aircraft that will handle all air conditioning requirements and, at the same time, supply a steady source of power to drive the aircraft's accessories. According to H. H. Rhoads, Hydro-Aire president, the new design saves from 20% to 40% of the weight of conventional equipment while cutting engine compressor bleed-air requirements some 50%.

Design approach used in Frijadrive is to have one "cold" turbine to cool bleed air for cabin air conditioning and to apply the energy extracted in this process to drive the aircraft's accessories. The other "hot" turbine develops any added power needed for accessory drive and also acts as a brake whenever the output of the "cold" turbine exceeds accessory drive demand.

Schematic diagram (right) of typical installation in jet aircraft. Twin-turbine unit is shown in the center. Below is a photo of Frijadrive.






FROM TAKE OFF . . .
Whenever an American jet needs a burst of extra speed — whether to get upstairs *fast* . . . to pull up and away after a "wave off" . . . or to flash out of the clouds on an approaching invader — it's the afterburner that adds the power boost! *And with CECO Afterburner Controls to govern afterburner thrust, extra power for speed bursts can be counted on when needed.* The engineering and production of dependable afterburner fuel controls for jet engines is but one of many CECO contributions to America's aerial supremacy.
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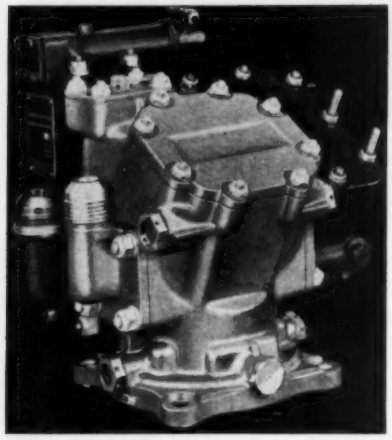
New Products

Hydraulic Pumps

Vickers, Inc. has unveiled a new series of lightweight aircraft variable displacement hydraulic pumps which combine a redesigned pump yoke assembly and a housing of magnesium-zirconium to provide up to 37% saving in weight and 33% reduction in size over previous models.

The new units have passed rigid



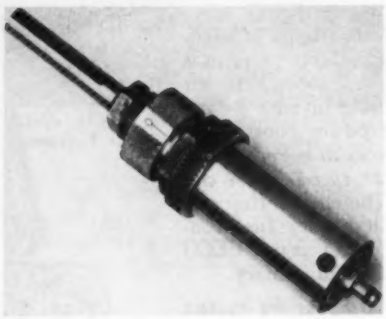
560-hour military tests and have shown ability to retain the 96%-plus volumetric efficiency and better than 92% overall efficiency of predecessor designs. The pumps are engineered for 3000-psi system operation and have nominal rated deliveries (at 1500 rpm) ranging from 0.60 to 23 gallons per minute.

Basic redesign of the yoke in the new pump is a change from the former U-shaped aluminum assembly with separate pintles to a new steel alloy casting having integral pintles. With the new assembly, internal yoke supports are no longer needed, thereby removing two internal bearings from the pump design.

Circle No. 1 on Reader Service Card, page 79, for more information.

Insert Tool

A new high-speed driving tool for installation of Rosan inserts and studs



incorporates a micrometric adjustment device to locate these parts to the desired depth below the surface of the parent material. Developed by Rosan, Inc., the tool fits standard drill chucks and can be used in any drill press or hand power tool without special attachments.

Circle No. 16 on Reader Service Card, page 79, for more information.

Ionization Transducer

Decker Aviation Corp. has announced development of a new measurement instrument, the T-442 ionization transducer, said to offer extremely large output signals (± 100 volts) while providing better-than-average resolution, high sensitivity, and ease of adaptability to measurement problems. An example cited is the measurement of angular displacement of a gyroscope without introducing disturbing torques.

The T-42 is essentially a glass tube with two internal probe electrodes filled with noble gases under reduced pressure. The gas is ionized by an RF generator and external electrodes producing ions and electrons. A space charge is created which furnishes an output signal that is a function of the configuration and potential of the electrodes.

Circle No. 6 on Reader Service Card, page 79, for more information.

Voltage Divider

A linearity tolerance of better than ± .05% and resolution exceeding .01% is claimed for a pilot model of the new Vernistat, a combination potentiometer

and auto transformer developed by Vernistat Div., Perkin-Elmer Corp., for servo system applications.

Advantages of its operating principle according to the manufacturer, are a combination of low-output impedance with the resolution and linearity usually associated with high-impedance multi-turn potentiometers.

Circle No. 5 on Reader Service Card, page 79, for more information.

Course Director

A new 10-pound flight director system developed by Orion Industries, Inc. for single and multi-engine executive

Hertz opens new office in the BALTIMORE, MD. Friendship International Airport

Hertz, already at major airports most everywhere, expands again to bring airlines NEW PASSENGER REVENUE.

Why Hertz brings more revenue to your airline

1. Hertz originated the Plane-Auto Plan. Many people who normally drove from city to city—mainly because they needed a car at their destination—now take a plane for speed and comfort . . . because they know they can rent a car from Hertz on arrival.

2. Only Hertz assures your passengers of a car wherever they go . . . because Hertz serves more airports and more cities throughout the world than any other rent-a-car system.

3. Hertz spends nearly $1,000,000 a year in advertising the Plane-Auto Plan in national magazines. No other rent-a-car company even approaches this figure!

Why your passengers prefer Hertz

1. Because of extensive advertising, Hertz Rent-A-Car has wide acceptance . . . and therefore people demand it.

2. Hertz offers 30 years' experience in courteous rent-a-car service . . . with nearly 850 offices in over 550 cities throughout the world.

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aircraft features an automatic crosswind or drift compensation that permits a pilot to fly a VOR airway or ILS approach precisely along the beam center. Using signals from the conventional localizer or omni receiver to derive its best course to intercept and hold a selected bearing, the Orion course director is flown simply by holding the vertical needle of a crosspointer indicator on center.

Precise heading data is obtained from a compass slaved gyro being produced as a separate unit by Orion. Weight of the gyro system is 7.5 lbs. and the director 2.5 lbs., and each is priced below $1000.

Circle No. 10 on Reader Service Card, page 79, for more information.

Load Banks

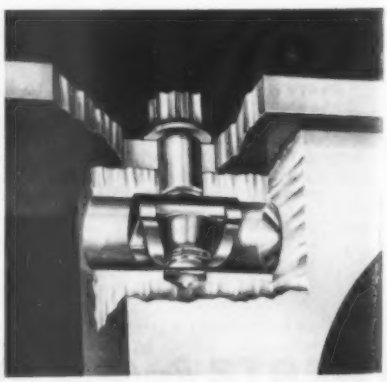
New load banks developed by Consolidated Diesel Electric Corp. for ground testing of complete a-c or d-c generating systems and components are convection-cooled and have no moving

parts. Designed for shop as well as field testing, the new units are used in pre-operational checks of generator sets to warn of poorly regulated or inadequate power.

Circle No. 13 on Reader Service Card, page 79, for more information.

Barrel Nut

Elastic Stop Nut Corp. of America has introduced a new self-locking barrel nut for joining aircraft forgings and other structural members without the



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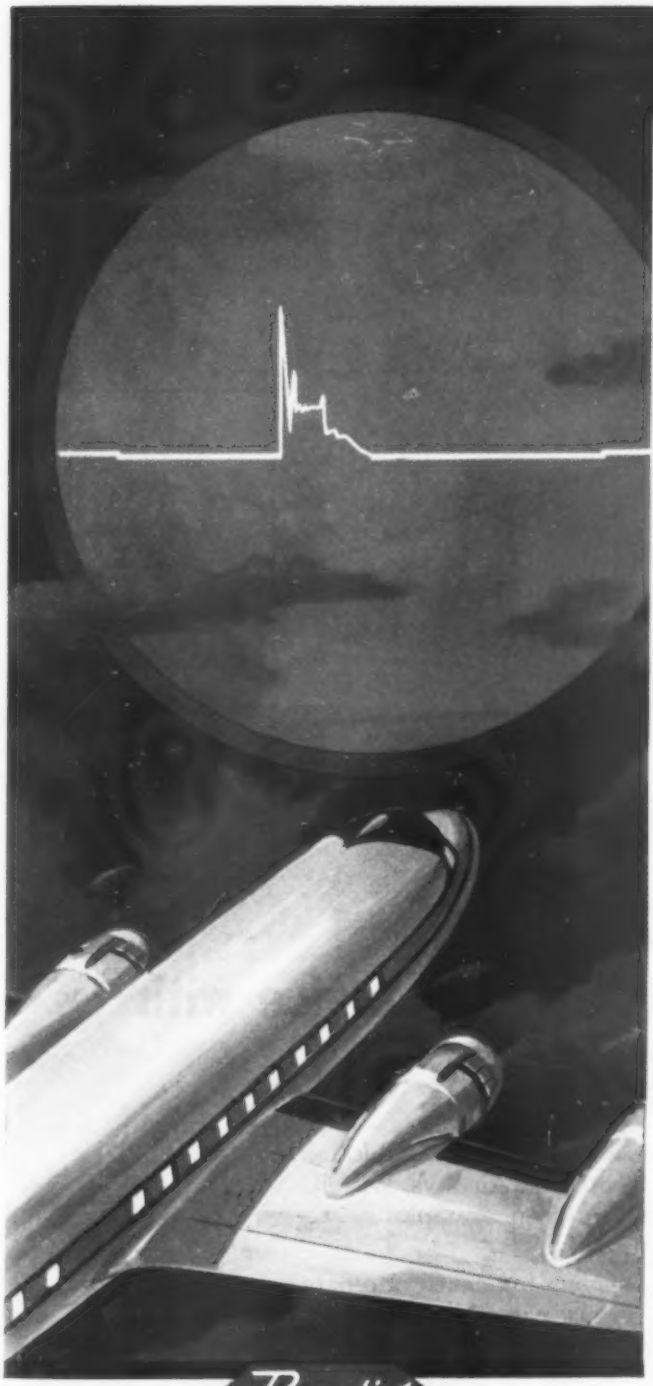

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These Pacific Coast and Hawaiian Island airlines make over 800 takeoffs and landings every day . . .

all three get outstanding service with AEROSHELL OIL

THE ENGINES in local service airlines are subjected to the toughest kind of operation. Southwest Airways, West Coast Airlines and TPA Aloha Airline are good examples . . . they make over 800 landings and takeoffs daily.

Short hops require that the engines frequently alternate between full throttle and idle. This service calls for an oil that can *take it* . . . that can operate with the high lubrication efficiency that gives low engine wear. That's why so many local service lines certificated by C.A.B. depend upon AeroShell Oil.

SHELL OIL COMPANY

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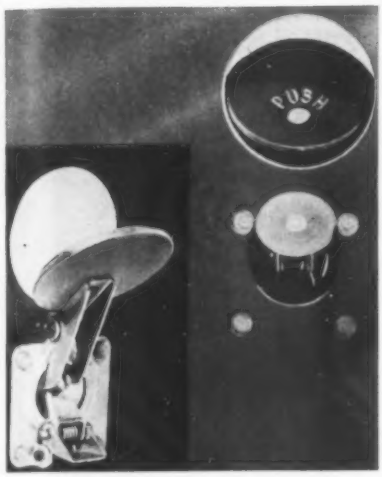
SHELL

need for large wrench openings. The Type 2552 stop nut, new ESNA design, is rated to withstand 180,000 psi loads at the pitch diameter of the bolt. Eight current sizes range from ¼-28 through ¾-16.

Circle No. 8 on Reader Service Card, page 79, for more information.

Flush Latches

Quick-opening flush latches for aircraft access panels and doors introduced by Modern Aviation Co. are specially designed for operation at extreme high and low temperatures. Utilizing an over-



center or toggle action to insure positive closing with only fingertip pressure, the new Modern latch installations feature an especially large latch button to permit operation even while heavy arctic or heat-insulated gloves are worn.

Circle No. 12 on Reader Service Card, page 79, for more information.

Control Switch

New compact 4-throw switch developed by Mason Electric Co. qualifies under Spec. MIL-S-9419 and is designed for use in pilot control stick grips of

military fighter aircraft. Switch is designated the 446100 series and is of the momentary contact type. Rating is 20 amperes inductive, 28 volts d-c.

Circle No. 7 on Reader Service Card, page 79, for more information.

Cleaning Gun

Available in two models, a new steam-solution cleaning gun introduced

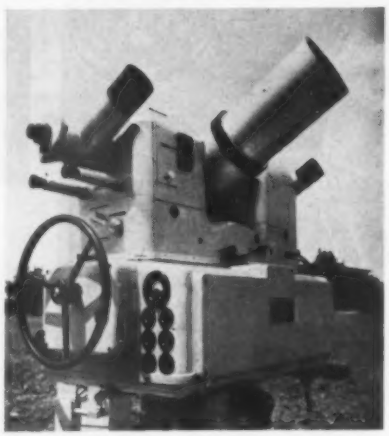
Jim Hong, Aerodynamics Division head, discusses results of high speed wind tunnel research on drag of straight and delta wing plan forms with Richard Heppe, Aerodynamics Department head (standing), and Aerodynamicist Ronald Richmond (seated right).

by Magnus Chemical Co., Inc. operates at steam pressures from 25 to 125 psi and features an integral valve for varying the strength of the cleaning solution. A small Model S gun weighs 4 pounds and measures 41" long; the Model L unit weighs 4¾ pounds and is 53" long.

Circle No. 9 on Reader Service Card, page 79, for more information.

Missile Tracker

New Swiss-built Contraves EOTS phototheodolite for tracking guided missiles and aircraft records time, position and attitude of target on 35mm film at rates of 10 or 30 frames per second. Maximum tracking speed is 30

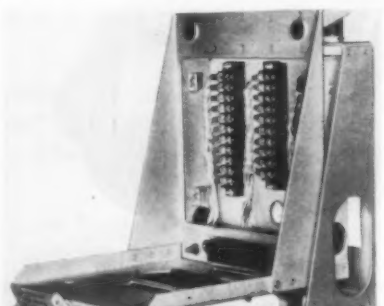


degrees per second and dynamic accuracy of the unit is said to be better than 0.1 mil, the equivalent of less than 1 ft. at a 10,000 ft. range. Available through Oerlikon Tool & Arm Corp. of America.

Circle No. 3 on Reader Service Card, page 79, for more information.

Mount System

A new shock-mounting system developed by Robinson Aviation, Inc. for North American Aviation, Inc. includes electrical connectors as integral parts of the mount base. Designed for



protection of electronic components, the new K173 mount system is said to offer maximum stability and to reduce rocking and tipping modes to a minimum.

Circle No. 14 on Reader Service Card, page 79, for more information.

new *SAFE FLIGHT* SPEED CONTROL SYSTEM zeros you in at perfectly controlled minimum speeds!

SAFE FLIGHT
Speed Control Indicator
Plane is being operated at proper speed when pointer is centered. Fail safe flag alarm guards against any malfunctioning.

Now—continuous direct information about wing lift at a glance! The revolutionary Safe Flight Speed Control System eliminates last minute calculations of gross weight, acceleration, configuration, turbulence, etc. . . . automatically displays the best lift coefficient at critical take-off and approach speeds. Fewer high-speed landings with excessive wear on brakes and tires. No excessive reverse pitching and overshoots!

Constant checking of the airspeed indicator is unnecessary: when the pointer of the Speed Control Indicator is on the triangle, speed and attitude are correct . . . initial climb is best under existing power and weight conditions. The Speed Control System's instantaneous non-lagging operation is particularly important in the event of engine failure in multi-engine aircraft after take-off.

Speed Control System components, including the Safe Flight Lift Transducer and Lift Computer—are rugged in design, unusually free of maintenance. Wing transducer coils are completely sealed. Flag alarm provides fail-safe indication. Speed Control System meets all pertinent Air Force, Navy and Civilian specifications.

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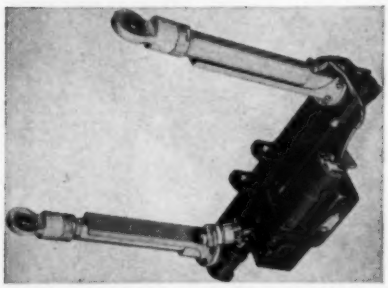
Seat Actuator

New seat adjustment actuator developed by Lear, Inc., Grand Rapids Div., for military aircraft is designed to withstand loads imposed by newest explosive seat ejection equipment. The Lear actuator, called the model 2450, weighs 8.3 pounds and is rated for maximum operating loads of 700 pounds tension or compression and static loads of 6600 pounds tension. Jackscrew stroke is 6" and overall actuator length is 9" when fully retracted. Unit qualifies under military environmental specifications, and operating temperature range is —65°F to +170°F.



Circle No. 15 on Reader Service Card, page 79, for more information.

Wire Markers

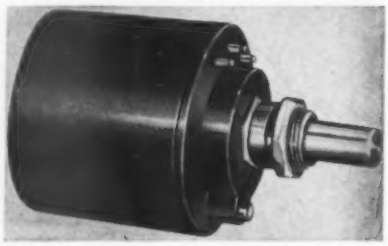
New all-temperature wire markers being produced by W. H. Brady Co. are rated for indefinite performance under continuous heat to 300°F, intermittent heat to 450°F, and continuous cold to —300°F. Literature available.

Circle No. 2 on Reader Service Card, page 79, for more information.

Potentiometer

A new low-cost Spiralpot slide wire potentiometer measures 1½" in diameter and weighs only four ounces. Available in standard 3-turn or 10-turn models with resistance ranges of 6 to 2500 ohms (linearities of ± 0.1% and 0.5%) the model 85175 Spiralpot is produced by G. M. Giannini & Co., Inc.

Circle No. 4 on Reader Service Card, page 79, for more information.



Low Frequency Vibrator

A new low frequency vibrator for vibration testing of aircraft structures has a three-inch stroke with a rated force output of 100 pounds. A development of The Calidyne Co., the new unit is trunnion-mounted and may be operated vertically, horizontally, or at oblique angles. Frequency stability is ± ½ of 1%.

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International Aviation

By Anthony Vandyk

ARE FICTION writers responsible for international airline timetables? A study of some trans-Atlantic schedule sheets would indicate that they are. Several timetables omit all reference to Gander and Shannon while others, slightly less dishonest, mumble (in fine print) about "technical stops." To the uninitiated it would seem that quite a few airlines make a practice of nonstop trans-Atlantic flights in both directions whereas, in fact, at least one of the unpopular Canadian and Irish intermediates is likely to be with us (for westbound flights, at any rate) until the advent of the DC-7C and aircraft with similar performance.

Those familiar with speed and range of various types of aircraft must raise their eyebrows when comparing the elapsed times for the journey between New York and Paris and vice versa:

Airline	Equipment	East-bound	West-bound
		(hours & minutes)	
Air France	Super Const.	13:00	16:15
LAI	DC-6/6B	13:30	16:50
PAA	Stratocruiser	15.45	17:30
TWA	L-749 Const.	14:05	15:35

On the New York-London route the comparisons are also interesting:

BOAC	Stratocruiser	12:30	17:00
El Al	L-49 Const.	17:00	19:15
PAA	Stratocruiser	12:30	16:00
TWA	L-749 Const.	12:25	16:00

Second only to the North Atlantic as a competitive route is the South Atlantic. For comparative purposes, the Lisbon-Rio de Janeiro sector serves best:

Airline	Equipment	South-bound	North-bound
		(hours & minutes)	
Aerolineas Argentinas	DC-6	21:00	21:35
Alitalia	DC-6B	19:05	21:45
KLM	DC-6B	20:30	21:20
Panair do Brasil	L-49 Const.	21:10	21:15
SAS	DC-6B	20:55	22:40
Swissair	DC-6B	21:05	21:05

On the South Pacific route, comparisons are interesting since each of the three carriers uses different equipment (CPA also calls at Auckland). The following are the elapsed times for flights between Honolulu and Sydney:

Airline	Equipment	South-bound	North-bound
CPA	DC-6B	24:30	23:30
PAA	Stratocruiser	23:30	23:00
Qantas	Super Const.	22:30	21:45

It should be emphasized that all the above times are elapsed; in certain cases shorter flight times are negatived by longer times on the ground at intermediate stops. It is elapsed time which interests the passenger. • • •

The Boulton P-124 Trainer (top left) and the SIPA 300.

The Jet Trainer Trend

New jet trainers from Britain and France are illustrated above. The Boulton P.124 is a new design which will gross 5400 lbs. and have a top speed of 380 mph at 30,000 ft.; powerplant is an Armstrong-Siddeley Viper. Latest French trainer, the SIPA 300, is now undergoing its flight test program. Developed from the SIPA 200, which has logged over 250 hours in the air, it grosses 1800 lbs. and cruises at 205 mph.

The Royal Canadian Air Force recently announced that it is seeking a tricycle-gear jet trainer with 1200-1500 lbs. thrust and side-by-side seating in a major revision of its training program. This includes the reintroduction of primary training (DH Chipmunks will be used for this initially) and the replacement of its T-6's as soon as possible. The RCAF is currently evaluating the Beech T-34.

Sweden, too, is revising its air force training program by eliminating the T-6. Instead pilots will fly for about 75 hours in the light piston-engine Saab-91B Safir and then switch to the Vampire jet trainer for 100 hours before getting their wings. This revision will involve the procurement of more Vampire trainers.

Transport Briefs

Revised fares for international flights decided upon at IATA Joint Traffic Conferences meetings in Venice last month will go into effect April 1, 1955, subject to government approval. In Europe, tourist fares go up 2½-5% in most cases. In the western hemisphere, chief change is a 7-8% cut in tourist fares in Central America between Mexico City and Panama. Between Europe, Middle East, and Africa increases are up to 5% between Europe and Dakar, and between Europe and Madagascar, Reunion, and Mauritius (mainly for first-class fares). In the Far East, excursion fares will be about 12½% below tourist levels on equipment inferior to four-engine pressurized aircraft. On the South Atlantic new fares will be 20% below tourist between Spain and South America in non-pressurized equipment.

Swissair has ordered two of the Douglas long-range transports for 1956 delivery . . . **Canadian Pacific Airlines** is likely to order two DC-7C's if it gets approval for its projected Vancouver-Churchill-Amsterdam route . . . **Linea Aeropostal Venezolana** has taken delivery of the first of its two Super Constellations; it plans to extend its Europe service to Frankfurt and Amsterdam soon . . . **Aerovias Guest** has opened a service from Mexico City to Panama: it is considering ordering a few Viscounts . . . **Panair do Brasil** is acquiring three more L-49 Constellations from PAA.

French government has decided to levy a head tax on all passengers departing from French airports starting December 1; tax will vary from $1.15 to $3.40, according to the distance to be flown, and will also be levied on cargo shipments.

Airwork Ltd. will start its scheduled North Atlantic freight service in March 1955 using DC-4's instead of Handley-Page Hermes as originally projected as interim equipment pending the delivery of its three DC-6A's; there will be two flights weekly from Milan, Frankfurt, Geneva, Zurich, London, and Prestwick to Gander, Montreal, and New York.

Military Briefs

Dutch Air Force is to receive 28 North American F-86K all-weather fighters under MDAP and will buy 28 more . . . **Norwegian Air Force** is also to be re-equipped with F-86's, probably 40 to 50 . . . **French Air Force** will form its first Dassault Mystere II fighter squadron by the end of the year.

Manufacturing Briefs

Canadair's present contract calls for the supply of 13 CL-28 Britannia patrol bombers; a projected transport version is designated CL-44 . . . **Latest version** of the Viscount, the stretched-fuselage 800 series, will be able to carry up to 70 passengers in its 111-inch longer cabin; gross will be 14,200 lbs. against the 700's 12,800 lbs.; first production 800 will come off the line in March 1956 . . . **D. Napier & Son, Ltd.** has bought a Convair 340 for experimental installation with two Eland turboprops; plane should be available for U. S. demonstration next summer.

Only a synthetic oil meets its lubrication specs.

How tough are lubricant specifications for new U. S. turbo jets? Well, they call for an oil pumpable at -65 degrees F, yet able to lubricate critical turbine bearings at over 450 degrees F. They call for flash point, viscosity, and load-carrying properties that just can't be combined in any existing mineral oil.

Esso research teams went to work on the problem. The result is a synthetic oil, Esso Turbo Oil 15. With more than 200,000 hours of engine test-stand and flight experience, it has met all specifications and tremendously increased turbo jet and turbo-prop performance.

Esso Turbo Oil 15 lubricated the premier flights of the North American F-100 (above), Boeing 707 and B-52, Convair F-102, Douglas A4D. A proud record for the Esso research teams.

Continuing research at Esso laboratories promises an even greater future for synthetic oils as gas turbine performance reaches new highs.

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EN ROUTE . . .

WAYNE W. PARRISH II

You can call me Ace . . . now that it's over

ABSOLUTELY the last thing on my mind when I boarded a KLM Convair at LeBourget Airport in Paris bound for Amsterdam one fine morning a few weeks ago was that I would be whizzing around the skies later that day in a jet trainer at speeds up to 550 mph.

You can call me Ace Parrish now that it's over, but when J. Gerritsen of Fokker Aircraft announced to me that a flight in Fokker's side-by-side S-14 had been set up for mid-afternoon, my stomach began turning around in all directions at once. I thought for sure that I should have retired from the aviation writing arena long ago. Could I possibly back out? Not gracefully. So I was hooked.

In my mind I wanted to go up, but sometimes one's mental processes collide furiously with the physical emotions. I'd flown some 9000 miles in the jet Comet I but that was a transport operation. I like altitude, and I like speed, but the mere thought of acrobatics makes my stomach go into contortions. I envisioned steep dives and all the rest and got mentally dizzy at the mere thought. Mom never reared me to be a jet jockey.

Now that it's over I can appreciate the enormous thrill the youngsters get in jet flying. I'd like to go again. There is an intense sense of exhilaration at flying in a small airplane at high speeds and whizzing in and around the cumulus banks. It's smooth and it's exciting. It was apprehension which never became justified that threw me into a loop before going up. Even so, I will steer clear of acrobatics, and on my Dutch flight I didn't get any because I got a promise in advance there wouldn't be any.

I had one of the finest pilots in the world to take me up, no less than Lt. Col. Gerben Sonderman, Prince Bernhard's personal pilot and chief pilot for Fokker. Now 46, Sonderman was a physical training instructor before he went into flying in the 1930's. He had a distinguished war record flying against the Germans from England, has been decorated many times, and is a wonderful guy with an engaging personality. He was leaving the next morning with Prince Bernhard (no mean pilot himself) on a long DC-3 flight through Africa.

WWP and Sonderman: Can I back out?

The Fokker S-14 is a highly rated trainer and if it doesn't acquire some substantial NATO orders abroad, something's wrong somewhere. Just a few weeks before my flight as a passenger, our U. S. Assistant Secretary of Navy for Air, James Smith, went to Amsterdam and flew the S-14 himself and was highly pleased. Smith is a strong advocate of side-by-side trainers, especially jets. Fairchild Aircraft has the U. S. license to build the S-14 if it can find a military buyer on this side.

Strapped in, I was hooked

For my flight I donned the customary flying suit and was strapped into an ejection seat, the first experience of this kind and one not destined to calm down the nerves of a novice like myself. But the S-14 taxied out to the end of the runway and took off with the greatest of ease and before I knew it we were up in the cumulus at 12,500 feet. Never have I had such a thrilling experience as weaving in and out of beautiful clouds at high speed. Far below, through the cloud breaks, was that entrancing Dutch landscape of lush green, blue water, orderly farms, and picturesque towns and villages.

How long I was up I have no idea. But after playing around in the clouds for awhile, we descended in a wide graceful spiral and picked up a lot of speed as we circled down over the airport. But the landing was slow and smooth. This guy Sonderman knows the S-14 better than anyone else and handles it beautifully. We talked back and forth on the intercom, and I could hear the Schiphol Airport tower. When Sonderman asked me if I wanted to have the S-14's stall demonstrated I yelled back a very firm "No." I guess I'm a sissy. But now that I know what it's like flying in a jet like this, I think I could take a lot more.

What I really went to Amsterdam for was to see how Fokker is getting along with the F-27 turboprop transport which has been designed for short-haul airline routes. At the moment there isn't much to see, but within another two or three months the prototype should be taking shape and Fokker expects to fly it sometime next summer. There's a lot of interest in the F-27 and Fairchild wants to build it in the U. S.

Bill Stackpole, v. p. of AMERICAN AVIATION Publications, had accompanied me to Amsterdam. That evening we had a fine dinner with Gerritsen and F. J. L. Diepen, a Fokker managing director, and Gerritsen raised a question which I'm going to pass on to you people for a proper answer. At Schiphol Airport there is a sign reading "13 Feet Elevation Below Sea Level." The airport, as you should know, is below the water level of the surrounding canals. Gerritsen maintains that you can't have anything *elevation below* and says the sign should simply read "13 Feet Below Sea Level." The Schiphol Airport management disagrees. I'm inclined to side with Gerritsen. So, just how *does* one describe an airport that's below sea level?

• • •

I didn't perform like this . . . but the S-14 Can

Traveling man – Family man

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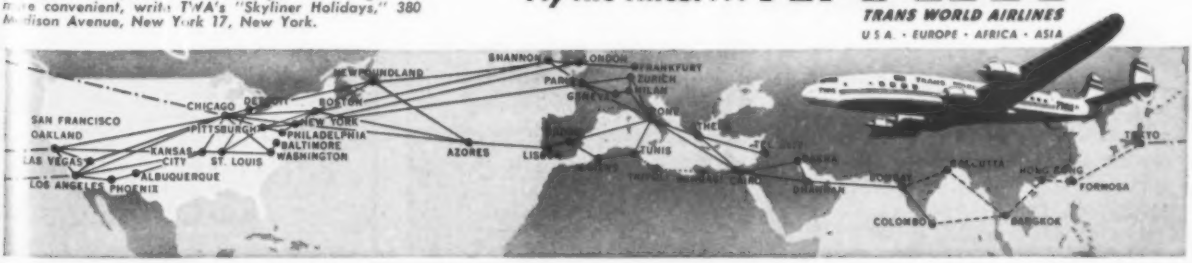

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Circle No. 20 on Reader Service Card.

HEATER CONTROLS. Bulletin F-4340-1 issued by Barber-Colman Co. contains data on remote adjustable thermostats for aircraft combustion heaters.
Circle No. 21 on Reader Service Card.

ENVIRONMENTAL TESTING. Bowser Technical Refrigeration has prepared a 12-page catalog describing its altitude, humidity, and low-temperature test chambers.
Circle No. 22 on Reader Service Card.

MINIATURE TRANSDUCER. Leaflet PT654 provides technical data on new flush-diaphragm strain-gage transducer. Electronic Engineering Associates, Ltd.
Circle No. 23 on Reader Service Card.

TEMPERATURE MEASUREMENT. New 7-page booklet entitled "How Temperatures Are Measured" is available from Tempil Corp.
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ELECTRICAL EQUIPMENT. Mission-Western Engineers, Inc. has published Bulletin 254 listing 50 basic types of miniature and sub-miniature motors, blowers, and fans.
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TITANIUM FOIL. Bulletin 100 prepared by American Silver Co., Inc. contains engineering data on commercially pure titanium foil.
Circle No. 26 on Reader Service Card.

ANCHOR BUSHINGS. Fourth edition of 20-page catalog on anchor bushings has been published by The Hi-Shear Rivet Tool Co.
Circle No. 27 on Reader Service Card.

COMPASS SYSTEM. Application and operation of MC-101 gyro-stabilized compass system is described in new 8-page brochure by Collins Radio Co.
Circle No. 28 on Reader Service Card.

SPEED CONTROL INSTRUMENTS. Single-engine (SC-12) and multi-engine (SC-24) aircraft speed control systems are described in 4-page brochure by Safe Flight Instrument Corp.
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PRECISION RELAYS. New 42-page catalog contains technical data on complete line of relays. Leach Relay Co., Div. of Leach Corp.
Circle No. 30 on Reader Service Card.

SILICON TRANSISTORS. Bulletin No. DL-S426 lists characteristics of production silicon transistors available from Texas Instruments, Inc.
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COMPLEX CASTINGS. Frozen mercury process for producing complex precision castings is illustrated in 8-page booklet by Mercast Corp.
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SERVO SYSTEMS. Series 1100 Servoscope signal generator and Model 1110A Servoboard to assist in servo system design are described in two 4-page pamphlets by Servo Corp. of America.
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Circle No. 34 on Reader Service Card.

JETCAL TESTER. 12-page technical manual describes use of new jet engine temperature system tester. B&H Instrument Co., Inc.
Circle No. 35 on Reader Service Card.

METAL CLEANING. "How to Clean Metals in Aircraft Production" is subject of 44-page booklet available from Oakite Products, Inc.
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AIRCRAFT PUMPS. "The Lear-Romec Story," a 20-page brochure published by Lear, Inc., describes the facilities, personnel, and products of its aircraft pump division.
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AIR DATA SYSTEMS. AiResearch Manufacturing Co., Div. of The Garrett Corp., has published a 26-page engineering folio on air data systems for aircraft and guided missiles.
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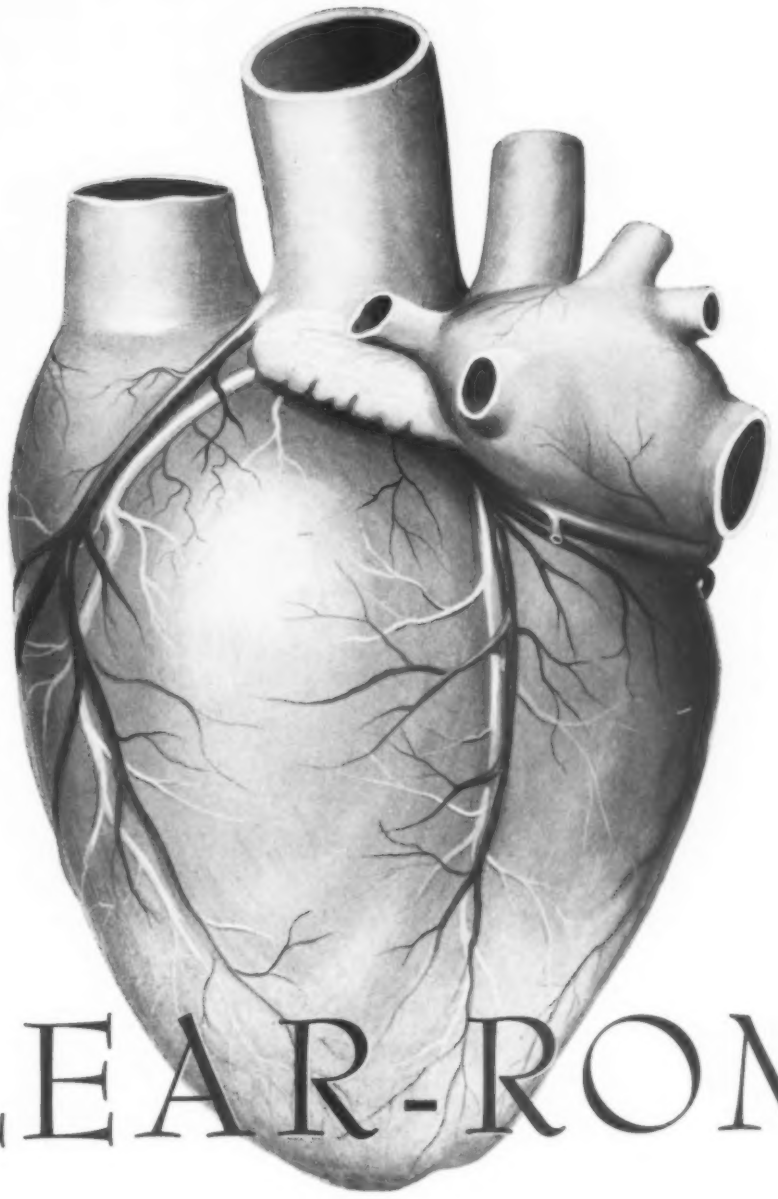

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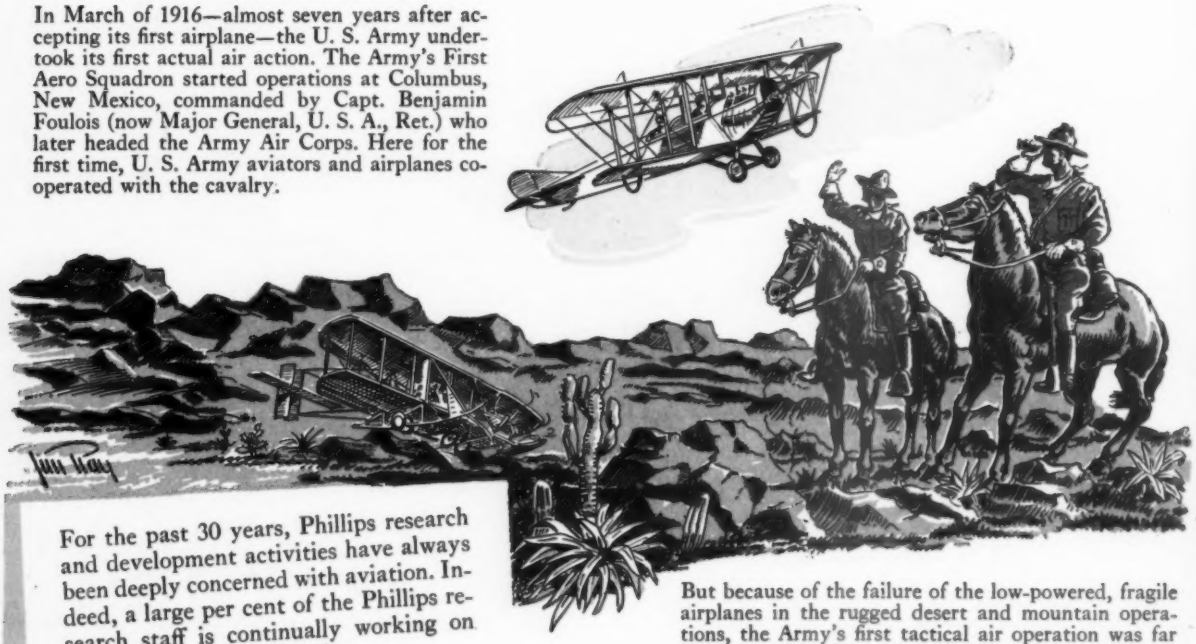

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